UNIVERSITIES QUARTERLY

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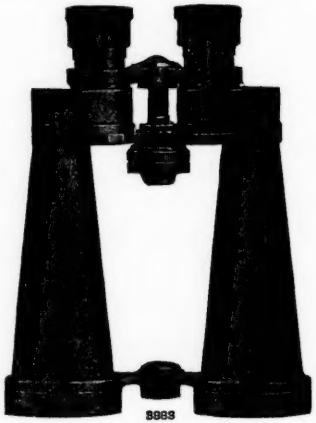

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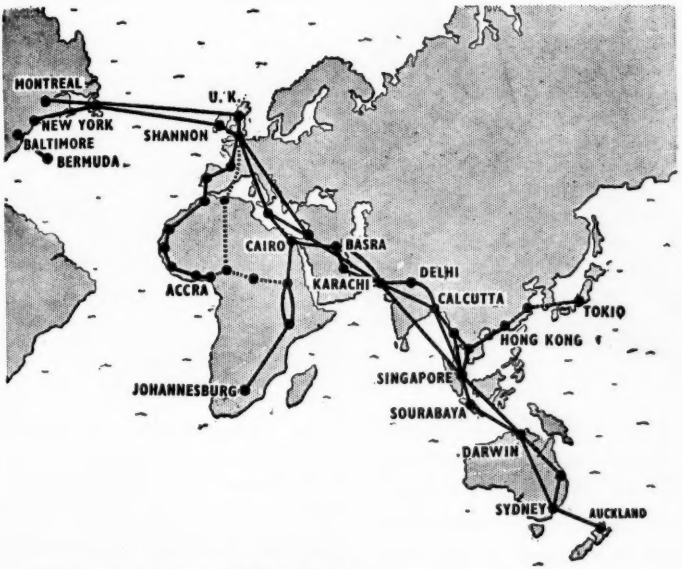

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UNIVERSITIES QUARTERLY

EDITORIAL NOTES

An Assured Future

Early in March the Chancellor of the Exchequer made two announcements of far-reaching importance for the universities. The first was in answer to a Parliamentary question on March 10th, and gave the size of the grants to the Universities over the next five years. The second was a letter to the Parliamentary and Scientific Committee on the subject of their report published last December on "Universities and the Increase in Scientific Manpower". Both are landmarks in the development of government policy on the universities.

As far as the grants are concerned, these are to be resumed on a quinquennial basis, and it is therefore again possible for the universities to make their plans ahead. But it is the size of the grants which is so remarkable. There is now no doubt that for the next five years the current income of the universities will be ample for all their needs, given the inevitable limitations on new buildings and larger teaching staffs. Indeed, the difficulties of obtaining any large expansion on the physical plane—new laboratories, lecture-rooms and halls of residence—may have the result that the universities will not be able to spend all the money they have been allowed. But the intention of the Government is plain enough : the expansion of the universities is to have full Treasury backing and for some time to come the limits will be set by physical and not financial factors. Mr. Dalton is to be congratulated for adopting so far-sighted a policy.

In 1938-39 the total Exchequer grant to the universities was £2.4 million including a very small non-recurrent grant for capital expenditure. For the past year, 1946-47, the total grant was £9.45 million : again the non-recurrent grant for capital expenditure was small. For the first year of the quinquennium, 1947-8, £3.5 million is set aside for capital expenditure and something over £8 million for other expenditure. Thereafter the recurrent grant is to rise by annual increments to almost £12 million in 1951-52—a far cry from

the two million pounds of 1938-39. The details are given in the table below :—

TABLE OF RECURRENT AND NON-RECURRENT GRANTS TO THE UNIVERSITIES

Grants	Recurrent	Non-Recurrent	Total (including other special grants from Exchequer Funds)
	£	£	£
1938	2,077,900	125,233	2,400,402
1946-7	5,232,670	290,000	9,450,000
1947-48	6,122,040	3,500,000	11,875,000
1948-49	9,970,000	*6,000,000	Not known
1949-50	10,620,000	*6,500,000	,,
1950-51	11,270,000	*6,600,000	,,
1951-52	11,920,000	*7,500,000	,,
	52,780,000	30,000,000	

* Rough estimates based on an expenditure of £30 million over the five years.

The figures for recurrent grants Mr. Dalton gave with certainty, but on the side of capital expenditure, covered by non-recurrent grants, he was unable to be so definite. The five-year programmes of expansion submitted by the universities would involve a capital grant of £50 million in all, £40 million being for new buildings and £10 million for acquiring new sites, existing buildings and new equipment. On this Mr. Dalton said :

> I accept this estimate of the need, and will do my best to meet it. I am advised however . . . . . that even after allowing for a high degree of priority, the best forecast at present possible does not justify the expectation that the Universities will be able to undertake more than £20 million worth of new buildings during the quinquennium.

If this is a fair estimate of the position, what does it mean ? It means that the universities will have to redraw their order of priorities. It is to be hoped that building conditions will improve in two or three years, but even so building schemes will have to be halved over the five-year period and this will require some drastic re-thinking. The effects of the limitation will vary from university to university according to how far the expansion in numbers is dependent on new buildings. London University may suffer most, but those universities whose opportunities for buying existing buildings or erecting

temporary buildings are limited, may be hard hit. In particular, there is likely to be little chance of building halls of residence.

These difficulties are not, however, of Mr. Dalton's making, but are due to the overall shortages of building labour and materials, and the increasing demands for them. It seems clear that anything the Chancellor can do to help the Universities will be done, and that they are suffering less, not more, than the nation as a whole.

University Expansion

In Mr. Dalton's second statement to the Parliamentary and Scientific Committee he appears to have accepted too readily the Universities' own estimates that they cannot expand to more than 88,000 over the next ten years. Building difficulties will be severe until say 1950, but thereafter it should not be impossible to provide for 100,000 places as far as building resources are concerned, and the limitation must be due to the reluctance of particular universities to expand beyond certain limits, to fears about the supply of staff and to doubts about the quality of the increased number of entrants. It is not at present possible to assess the relative importance of these objections, but they require closer examination, and Mr. Dalton should certainly reconsider his attitude in a year or two.

In any discussion for expanding the number of university students there is always the unresolved problem that both the aggregate demand for graduates and the separate demand for different specialisms is unknown. The inquiries into the demand for scientists undertaken by the Barlow Committee were quite inadequate to provide any real assessment of the need for different kinds of scientists; yet more inadequate are the inquiries made on the arts side, apart from the estimates of the numbers required for teaching; some professional organisations have made estimates of their own needs, and the Manchester Joint Research Council has carried out a limited inquiry in its own region (see note below), but none of these have been dovetailed into any national plan. It is urgently necessary that proper inquiries should be set on foot to find out what are the likely demands for graduates with the different types of degree and qualification in order to give some guidance to the university authorities. Otherwise

there will be a serious lack of balance between supply and demand, and perhaps unemployment in certain sectors.

The shortage of university teaching staff is a real difficulty, perhaps the most real of all. But here again the facts are not known, and without them any sound judgment is impossible. What is surprising is that with the existing expansion from 50,000 to 65,000 students so little has been heard of this particular problem so far.

An interesting side-light on the growth in the numbers of potential university students is thrown by the figures of boys and girls taking the Higher School Certificate examinations. In 1939 there were 13,000 entries of which 10,000 passed. In 1946 there were 23,000 entries of which 16,700 passed. An increase of almost 70 per cent in the numbers qualified for university entrance is encouraging. Another sign of the times is that in 1939 only 44 per cent of the papers taken were on the science side; by 1945 the proportion had risen to 53 per cent.

Lessons of the Coal Crisis

The recent coal crisis has thrown a far brighter searchlight on the organisation of the coal industry than either the Coal Nationalisation Act or the Reid Report succeeded in doing. It has shown how desperately the country needs more first-class mining engineers to ensure that the deficiencies of manpower can be made good by mechanical means and technical skill. At present Great Britain is not producing enough good mining engineers and her method of training them is wasteful of scar ce teaching resources.

The Royal School of Mines at the Imperial College has high traditions, is well equipped and well staffed. It turns out about 20 good class graduates each year for the metal mines of the Empire, but it produces very few for the coal mines. The Bochum School of Mining in Germany turns out high-grade mining engineers for the coal mines of the Ruhr. It had before the war an income of £125,000 a year, a large staff and magnificent premises.

It is regrettable that no facilities exist in Britain comparable to those provided by Bochum and by the Royal School of Mines for mining engineers other than coal. There are nine mining departments at the Universities with 227 students; none of which are

adequately financed and which, therefore, labour under a considerable disadvantage in their attempt to turn out mining graduates of the highest standard. The dispersion of resources is far too wide, and there is little doubt that this national failure in the education of the highest grade of coal mining engineers was one of the factors which contributed to the decreasing efficiency of British mines compared to those of other countries in the inter-war years.

The following table and quotation taken from the Reid Report on the Coal Mining Industry published in 1945 illustrates this fact strikingly :—

Country	*OMS in 1925	OMS in 1936	Percentage Increase
Holland	16.48	35.94	118
The Ruhr ..	18.62	33.66	81
Britain	20.62	23.64	14

* Output per man-shift.

"Natural conditions in Britain are comparable with the Ruhr and Holland, and therefore offer no explanation of the much lower OMS obtained in Britain."

The new terms of reference which the Chancellor of the Exchequer has given to the University Grants Committee instruct them to see that the Universities meet the needs of the nation. Here is an opportunity for the U.G.C. to render conspicuous service. Will they make it an urgent task to see that a concentration of University mining departments takes place, and that a school for education and research in coal mining engineering is developed at least of a standard equal to the Royal School of Mines ?

A Manchester Enquiry

The report recently published by the Manchester Joint Research Council on the demand for graduates in industry is an excellent piece of work. The Council undertook a survey of the Greater Manchester Area, and by means of a questionnaire addressed to firms in the district attempted to assess the number of scientifically trained men who are likely to be required in the various industries within the next few years. The returns indicate an expected overall increase of

80 per cent in the number of graduates employed, but the figure varies considerably from industry to industry. For instance, chemical firms envisage an increase of 100 per cent, whilst in engineering the expected expansion is only 62 per cent, and in textile finishing it is still less (30 per cent). There is evidence of a small upward trend in the total number of firms which employ graduates, but there is considerable room for improvement. It is significant that it is the firms with experience of employing graduates which show a marked readiness to increase the number of graduates employed and are responsible for the bulk of the proposed increase in number.

Firms employing some 80 per cent of the total number of graduates have expressed a preference for men trained in research methods, and in 60 per cent of the firms which employ graduates the higher executive posts are open to scientific workers who demonstrate a bent for management. Some 80 per cent provide openings for such workers in plant control. Smaller firms tend to prefer graduates with a general scientific and technical training, whereas larger firms, which normally possess research and development departments would prefer men with post-graduate research training. A disconcerting feature is that more than half the number of firms which replied expressed themselves as not in favour of post-graduate refresher courses for their employees. These are mostly the smaller firms for which such a negative policy would appear to be particularly short-sighted.

Similar enquiries are obviously needed for other regions, but so far as this particular survey is concerned the overall figures of requirements for the next few years do not differ materially from those given in the Barlow Report. It is clear, however, that the incidence of the increased demand may vary widely from subject to subject and until further information is available detailed planning of university extensions will be difficult.

The Social Sciences

The articles in this number deal mainly with the place of the sciences in the universities, and Lord Beveridge in the first article stresses the importance of the social sciences. We regard their

development as perhaps the most important task before the universities, and we are glad to begin our discussion of this subject by publishing this imaginative and wide ranging article by one who has unique qualifications in this field.

It is not possible to make any exact estimates of the sums spent on research of different kinds, but Mr. A. V. Alexander's statement in the House of Commons on March 19th throws into relief the enormous disparity between research expenditure for military purposes and government expenditure on research for peaceful ends. In the coming year the Admiralty and the Ministry of Supply will spend £60 million on scientific research and development. Other Government expenditure on researches of different kinds is given below :—

GOVERNMENT GRANTS FOR RESEARCH

ESTIMATES OF EXPENDITURE 1947-48

	£
Agricultural Research Council	402,000
Medical Research Council	698,000
Agricultural Research financed direct by Departments of Agriculture*	1,289,000
Fishery Research	222,000
Department for Scientific and Industrial Research	3,118,000
Colonial Research	1,000,000
Social Survey	50,000
Universities—total recurrent grant	12,000,000
	19,389,000

* This includes capital grants and grants in aid of annual expenditure to Colleges and Institutes.

Part of the expenditure of the Department of Scientific and Industrial Research is on behalf of the Service Departments and only a small proportion of the grant to the universities is for research purposes, so that the comparison between the table and Mr. Alexander's figures gives much too favourable a picture.

The Clapham Report on the " Provision for Social and Economic Research " (Cmd 6868) published in July 1946 estimated that 3 per

cent of the total expenditure on departmental maintenance in the universities was spent on the social sciences in 1938-39 :—

Faculty	Total Departmental Maintenance. £	1938-39 Per cent
Arts (excluding Social Sciences)	1,084,873	28.2
Pure Science	986,663	25.6
Medicine (including Dentistry)	885,964	23.0
Technology	533,224	13.9
Agriculture	241,625	6.3
Social Sciences	115,909	3.0
Total	3,848,258	100.0

and recommended an additional expenditure of £250-300,000 a year. This recommendation should be implemented as soon as possible. An interdepartmental committee has been set up to survey and advise upon research work in government departments with representatives from the London School of Economics, Nuffield College, Oxford, the Applied Economics Department at Cambridge and the Social Science Department of Liverpool University upon it. This Committee, from its terms of reference, appears to be concerned only with research carried out by government departments, and it is surely time that the universities and the Universities Grants Committee came to some decision about university developments in this field. No doubt the increased grant will permit more social science research in individual universities, but, as in the case of mining departments, more planning and co-ordination is required.

State Scholarships

On March 27th the Minister of Education announced that the numbers of State Scholarships awarded on the results of the Higher Certificate examination would be increased this year from 360 to 750. This is an important development. It is also proposed to limit for the first time the numbers of the State scholars going to Oxford, Cambridge and London Universities. Under the new arrangement half of the total number of new scholars will be permitted, if they wish, to go to these three universities in the proportion of roughly 125 students to each; the rest will have to go elsewhere. In proportion to their numbers, this still gives Oxford and Cambridge

universities an undue preponderance, but it was felt that they could not well be allocated fewer scholarships students than they have had in the past.

Two further experiments were announced at the same time. The first is to give 100 technical scholarships to students who go into industry and commerce from school and take part-time classes. The awards will be given to students under the age of twenty on the recommendations of the Principals of Colleges for Further Education, and on the advice of a Selection Committee. Their value will be similar to that of the normal State scholarships and will cover fees and full maintenance based on a generous income scale. These scholarships reflect the needs of the nation for larger numbers of scientific and technical students, and are very welcome.

Finally, there are to be twenty scholarships to students of mature age, who have missed university education and have shown special promise in later life. Scholarships will be awarded on the recommendation of local education authorities or recognised bodies for adult education on the advice of a selection committee. This means that a really able man of, say, thirty with a wife and children will receive grants adequate to give him a full university education. The number of scholarships in this category seems small, but the method of selection is entirely untried and until some experience has been gained the Ministry prefer to keep the numbers down. There are many men and women who develop late in life, or whose early opportunities have been limited, and this new scheme should provide them with a valuable opening.

These three schemes reflect the Ministry's appreciation of the difficulty of greatly increasing the number of university students without at the same time providing the money by which the students can meet their expenses. In addition to these scholarships awarded by the Ministry of Education there are already 1200—1500 open scholarships and exhibitions awarded by the universities and supplemented by the Ministry to the full amount if required, 1800 awards made annually to intending teachers entering the universities, and 1500—2000 Major Awards given by the local education authorities on which the Ministry pay grants. The total number of awards from public funds, which cover fees and maintenance, is thus about 6000

annually, and there are in addition those grants and exhibitions given by schools and trusts. As the universities expand it will certainly be necessary to increase the numbers of grants, but this is a good beginning.

Scarborough Report

The Scarborough Report (April 17th, 1947) sets a new precedent in government planning for the universities. Its task was to consider education and research at the universities in relation to the main population groups in the whole of Asia and Africa and the Slav countries of Europe—about half the human race. "We discovered, when war broke out, how lamentably ill-equipped we were for intercourse with oriental peoples." It urges that the universities should interpret to the British people the whole way of life of these people, not only their languages, but their history, geography, economic development and sociology.

It proposes that 7 sets of institutes should be set up in the British universities to study 4 Asiatic, 2 Slav and 1 African groups of peoples. Each institute should be a substantial organisation with a varied staff and should be an effective centre for research and education and information. There would be from 2-5 universities studying each group; perhaps 20 institutes altogether. It is suggested that the cost to the Exchequer might be £225,000 in 10 years, and later on twice as much. A very important and highly novel recommendation is that the teachers in these institutes should visit the countries with which they are concerned not less than once every three years. One surprising and, perhaps, doubtful recommendation is that about three-quarters of these institutes should be at Oxford, Cambridge or London.

This is university planning with a vengeance. It is a bold and imaginative scheme and, in its broad outlines, is very welcome.

Egyptian Education

With the military evacuation of Egypt gathering speed, it is to be hoped that British cultural activities will cease to be suspect as a cloak

for propaganda. We ought to do our utmost to turn to account the decrease of our military strength by extending our cultural influence in so favourable an atmosphere. Instead we are in danger of losing ground. The British Council, which has to cope with an enormous demand for British education, finds itself faced with a reduction in funds. And this, at a time when more and more British Institutes could well be opened to receive the hundreds of students rejected for lack of room.

In the Cairo and Alexandria Universities, it is becoming increasingly difficult to fill the vacancies caused by the resignation of English lecturers. In 1946 alone, about one third of the Englishmen in the Faculty of Arts in Cairo left the country. The high cost of living, coupled with the absence of any pension scheme, has brought this about rather than the possible risk of dismissal when the last vestige of British control has gone. The prominent part which students have played in the anti-British demonstrations of the last twenty-five years has produced only rare instances of animosity towards British culture and its exponents in the universities.

There is evidence that the Egyptian educational authorities are becoming concerned at the departure of so many Englishmen from the schools and universities. A scheme is afoot to give all foreign lecturers (both English and French) two increments each year, and one third of their salary as expatriation allowance, but this, if adopted, would provide no more than a partial relief. Some arrangements by which the Egyptian and British Governments contributed to a joint pension fund might ease the difficulty about pensions. The salary question is more difficult. The French practice of granting subsidies to her teachers abroad is open to the objection that it maintains a double allegiance, though it does not appear so far to have caused any difficulties, and has resulted in sufficient numbers of applicants from Frenchmen for vacant posts.

In the meantime, the university in Alexandria (opened in 1942) has now some four thousand students. And there is a project for the establishment of a third university at Assiut in Upper Egypt. It would be tragic if through financial considerations insufficient English lecturers were forthcoming to fill such posts as might be open to them.

Foreign Students

The demand from foreign students for a university education in this country has increased like the demand from British men and women. This is due partly to the reduction in university facilities on the continent as a result of the war and partly to a world-wide increase in interest in higher education. Full statistics for the current university year are not available, and those for the year 1945-6 reflect only a return towards pre-war numbers and do not show the large entry in October 1946.

NUMBERS OF OVERSEAS STUDENTS IN BRITISH UNIVERSITIES

	Total	Students from the British Empire	Students from Foreign Countries
1938-9 ...	5,213	2,857	2,356
1945-6 ...	3,827	1,816	2,011

Nevertheless a few figures from individual universities for the year 1946-7 show the present trend. For example the numbers of overseas students at Cambridge have increased from 495 to 720, at Manchester from 107 to 346, and at Birmingham from 125 to 193.

In America the same trend is visible. Before the war the peak number of foreign students was 10,000 : there are now about 15,000, and there are those who estimate that the numbers will rise to 25,000 or 30,000.

The presence of foreign students in a university is a healthy and encouraging sign. The interchange of experience and ideas is one of the most valuable things a university can give. Unfortunately the traffic in this country is mainly one way and more should be done to encourage British students to go abroad. A most interesting account of the encouragement given to the two-way traffic of students in America is given in the most recent report of the American Institute of International Education.

SCIENCE AND THE SOCIAL SCIENCES†

By Lord Beveridge

It has become a commonplace that the greatest danger to man comes now not from nature but from himself. Natural science wringing from the material world around us one secret after another, teaching man how he can meet his needs ever more fully with smaller effort, teaching him how to avoid all natural dangers, teaches him at the same time how he can destroy his fellows and his civilisation, if he chooses to do so. The 19th century, the age of engineers, prepared the way for the war of engineers which broke out in 1914. The 20th century, having given us this war, has already in its first half proceeded to the war of physicists, with radar and the atomic bomb as their most spectacular but not their only contributions. In the second half of this century, we are told, the physiologists may have their turn; deliberate spreading of disease among men, animals and plants opens the possibility of all the nations on both sides of the next contest being equally and simultaneously destroyed.

Natural scientists are not to blame for the misuse by mankind of the results of their labours. But happily they are becoming aware that someone somehow must find a means of preventing misuse. My purpose in this article is to suggest one of the practical contributions which natural scientists could make now to the solution of this common problem.

†In order to give each issue of the UNIVERSITIES QUARTERLY a distinctive character and to canalise opinion on a particular subject we have decided, as far as possible, to devote several articles in each number to the same subject and to group them together. The articles are designed to represent different points of view and to give an opportunity for a deeper and more co-ordinated study of each problem. In the present number the dominant theme is the place of science in the universities and the following four (five) articles are devoted to a discussion of this problem from different points of view, including the relation between the social sciences and the physical sciences. In the July number we hope to deal with the teaching of philosophy in the universities in a similar manner with articles from several contributors. We should welcome comments from our readers on this experiment.

The remaining part of each issue will be devoted, as before, to a number of different topics.

Misuse of the results of natural science is not confined to the deliberate wholesale destruction which comes about in modern war. There are many other endemic evils among us, the by-products of our mastery over nature, and above all of industrialisation. These evils include the apparently endless growth of ill-planned cities; they include unemployment, wage disputes, waste of productive power by management and by men alike; they include waste of resources, in providing luxuries for the few before bread and health have been provided for all who work.

If mankind is to make worthy use of this growing mastery over nature he must learn how to master himself. To win that mastery he must take the same road as has led to his mastery over nature, the hard long road of science, applied not to nature but to man in society.

This was the main theme of an address which in October 1920 I delivered near the beginning of my time as Director of the London School of Economics and Political Science.

> The physical obstacles to man's material prosperity—intractable materials, inclemencies of climate, distance and the rest—are largely overcome; the natural perils to man are speedily passing out of his daily life. There was a time perhaps when the most urgent peril to man's life consisted in wild beasts. Then came cold; then the 'lightning and tempests, plague, pestilence and famine' of which the Litany makes mention. Till a century or two ago these were very real dangers. One has only to think of the smallpox and other diseases which ravaged Europe, or of the repeated famines which killed men by thousands in such countries as France in the eighteenth century. The lightning rod is a relatively recent invention; the safety of the seas in face of tempests has grown steadily with one invention after another. Of the perils of the Litany we had practically ceased to take account ten years ago. But are pestilence and famine gone from Europe for ever? Look round you and look back, not ten years but three.
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> Man-killing pestilence and famine had been brought back by man's own actions. The main danger to man and to his civilisation now comes, not from nature, but from man's own warring passions and ideals; his most urgent study is not nature, but himself.

That was how things looked just after the first World War. The disaster from which European civilisation had barely emerged was a call to man to study himself even more than nature, to put economics before engineering, politics before physics. So far as the rising generations were concerned, the call was answered. The London

School of Economics and Political Science grew fantastically, but never fast enough for the stream of eager youth from every country in the world. The same thing happened elsewhere. Endowments, buildings, research institutions devoted to the study of human society multiplied, but never, it seemed, fast enough. The faculties of nearly all universities dealing with social sciences became flooded with students beyond their capacity to teach.

There was never any difficulty between the wars in attracting the young to study economics or politics. Yet it was not possible in those years to feel that these studies had established themselves with the right authority in the judgment of mankind. In an address on 'The Place of the Social Sciences in Human Knowledge' which I gave on leaving the London School of Economics and Political Science in 1937, I tried to face this fact and to explain it. I suggested four conditions for success in placing the social sciences where the interests of mankind needed that they should be placed.

The first condition is that we should regard them as sciences and not as a branch of the humanities. In the University of London, the first degree in Economics is described as 'Bachelor of Science in Economics' but the name of the degree is the only point of contact between economics and natural science. For every other purpose in that university, in the great dichotomy between Arts and Science, economics and all the other social sciences are ranked with the arts. In many other universities there is no separate faculty or degree for economics or political science. The social sciences are either part of Arts or part of Law.

The second condition is that the social sciences should be placed in their right relation to the other sciences. In my address I described the white ray of science in terms of the spectrum, as proceeding from the abstractions of mathematics through physics and chemistry to biology. I suggested that, as beyond the visible spectrum from red to violet there were rays whose use was vital for health, so for the happiness of mankind we must develop new forms of human knowledge beyond those previously recognised. But we must choose the right end of the spectrum for this purpose. A good deal both of economics and politics in the past has consisted of abstract analysis, a form of infra-mathematics, without regard to realities. The gap

needing to be filled by the social sciences is at the other end of the spectrum; they should be regarded not as infra-mathematics but as ultra-biology. They must be based upon study of facts not deduction from concepts. "I profess to learn and to teach anatomy, not from books but from dissections, not from the positions of philosophers, but from the fabric of nature." So William Harvey announced his programme 300 years ago. If we are ever to make social sciences which can be equal to their task we must "profess to learn and to teach economics, politics, sociology, not from books, but from observations; not from the positions of philosophers, but from the conduct of mankind."

The third condition of success in establishing the social sciences is to study and to teach them not in isolation but together. Their common subject is man in society. That is a subject with many facets, and individual social scientists will have to concentrate on one of these facts rather than attempt to master them all. Economics is a study of human behaviour in the disposal of scarce means between alternative uses. Politics is a study of the behaviour of mankind in the use of force. Jurisprudence, anthropology, the study of social institutions like the family all have their special techniques. No one man can master all these techniques. The specialisation which has become so marked a feature of the natural sciences is no less needed in the social sciences. But each specialist should be in constant contact with others working in neighbouring fields. In founding the London School of Economics and Political Science, to make economics a science of observation rather than deduction, the Webbs showed their wisdom also in making the scope of the School wide, to cover all branches of study that might contribute to understanding of man in society. With economics and politics they combined history, law, sociology, anthropology, geography. At one point in my time at the School it seemed that a natural development of this policy of breadth, and one which would help to bring its studies into the scientific fold, would be to include in the School a department of social biology, a bridge between the social sciences and the natural sciences. This attempt has now been abandoned but I am certain that it was right.

There remains to my mind a fourth condition for success in establishing the social sciences: that those who devote their lives

to these studies should practise emotional detachment—above all from political controversies and the organisation of parties. This has appeared to many of my colleagues a hard doctrine, not easy to reconcile with the indispensable freedom of utterance of every scientist. It was not a doctrine that I held always. But I believe that it is a doctrine which by self-denying ordinance those who make teaching and study of social science their vocation should adopt for themselves; the establishment of social science as science is more important than any immediate aim.

This was what I found myself saying after eighteen years at the London School of Economics and Political Science. The School had grown beyond all recognition. Economics, politics and the rest had not yet grown to be science. Yet I added, there was no ground for despondency in this:

> The place of the Social Sciences in the scheme of human knowledge is that of the last-born of the sciences of observation; their affinities are here, rather than with mathematics or philosophy or arts. Let me stress in conclusion one word of that sentence—the word 'last-born.' To those who pursue the Social Sciences to-day are befitting two qualities which mark becomingly the generous youth; modesty about present achievement, boundless ambition for the future.
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> Thinking of our studies as one of the family of sciences, we slip easily into forgetting their youthfulness, into assuming that they have reached the same maturity and deserve the same honour as the older members. So Benjamin always measures himself against his elders; cuts himself with his brothers' razors; feels himself to be grown up before his time. In truth the Social Sciences are not grown up at all. The Social Sciences are best seen in perspective by considering the natural sciences, not as they stand to-day, but in their beginnings 400 years ago....
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> We should think of the father of political economy in terms, not of the last half of the eighteenth century, but of the first half of the sixteenth. Adam Smith made the same kind of revolution in the study of society that Copernicus made in the study of the stars. But the system of Copernicus in its final form was set out in a tract of 1529; the 'Wealth of Nations' appeared 250 years later, in 1776. The difference, moreover, between modern astronomy and economics is not merely one of 250 years in their birthdays. For two reasons, we should expect the younger science to show a slower growth. Its subject matter is more complex and variable. The essential instruments and materials of research are barely beginning to exist.
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> There can be no science of society till the facts about society are available. Till 130 years ago we had no census, no knowledge even of

the numbers and growth of the people; till fifteen years ago we had no comprehensive records about unemployment even in this country, and other countries are still where we were a generation or more ago; social statistics of every kind—about trade, wages, consumption—are everywhere in their infancy. When Galileo set out to study acceleration under gravity, he had no clocks that would measure small intervals of time, no mechanism that could record the passage of a mass falling vertically; he was driven to devices like rolling balls down sloping boards and comparing the weights of water that would flow from one vessel to another while the balls were rolling. Every economic statistician still lives by indirect devices of this kind.

From Copernicus to Newton is 150 years. To-day, 150 years from the 'Wealth of Nations,' we have not found, and should not expect to find, the Newton of economics. If we have travelled as far as Tycho Brahe we may be content. Tycho was both a theorist and an observer. As a theorist, he believed to his last day in the year 1601 that the planets went round the sun and that the sun and the stars went round the earth as the fixed centre of the universe. As an observer, he made with infinite patience and integrity thousands of records of the stars and planets; upon these records Kepler, in due course, based his laws and brought the truth to light. If we will take Tycho Brahe for our example, we may find encouragement also. It matters little how wrong we are with our theories, if we are honest and careful with our observations.

Modesty about our achievement is appropriate to all of us who claim to be social scientists. But modesty need not mean discouragement and should not apply to our ambitions. It is needless for me in this hall to plead the importance of our studies. Without them civilization is in danger. With each year that passes, it becomes more plain that, without better understanding of themselves and of society, there can be no assured happiness for mankind. The mission of those who would replace passion by reason and prejudice by understanding in human affairs is one of the most important in the world. The field in which we have to work is rich with promise.

In the past 150 years the natural sciences have won for themselves an assured place in public esteem, a safe kingdom of international co-operation, an influence second to none in all our Universities and Schools. For the Social Sciences that esteem and place are still to win—perhaps in 150 years to come. The two keys that can unlock the gateway to this promised land—both keys must be used—are observation and detachment.

This I found myself saying in 1937. Since then the second World War has come to underline the lesson of the first, bringing fresh conquests over nature. The establishment of a Science of Human Society should now have the first call on all our resources and our efforts. What does this mean in practice? It means that these sciences should receive at last in full and overflowing measure the

material means which they require for their development, as sciences not as arts, as sciences of observation not of deduction from first principles, as ultra-biology not infra-mathematics.

The first step is to increase by many times the number of permanent posts in the university faculties of Social Science. There is room for institutions devoting themselves wholly to research without endeavouring to teach. But the combination of research and teaching for which universities stand has proved itself by experience, as likely to be most fruitful for both purposes. But it is essential to realise that what is wanted is more permanent university posts, rather than studentships or temporary grants for making particular enquiries.

The second step is to make certain that this vastly increased number of university professors, readers and lecturers in social science have the material means of research. In accord with the view expressed here the emphasis should be on statistical laboratories and provision and training of field-workers rather than on libraries. The social sciences must be founded on observation, not on books enshrining the positions of philosophers. The social sciences are largely debarred from the use of one of the most valuable methods of the natural sciences: controlled experiment. How much further on should we be to-day in our knowledge of human heredity if it were possible to ordain that every pair of identical twins should be separated at birth and distributed to suitably varied environments! Inability to use controlled experiment in the social sciences makes it all the more important that the available techniques should be exploited fully. The two most important are statistics and field work. Social scientists must have statistical laboratories with equipment and staff beyond anything that has been realised or imagined in Britain hitherto. They must be able to conduct field work not in primitive communities only as anthropologists but in industrial societies, not by the professors themselves becoming engaged in politics or business or public administration, but by their having abundant trained investigators for this purpose.

The building up of the social sciences would not of course in itself lead to prevention of war or other misuses of natural science. Man must have the will as well as the knowledge to make the right use of his powers. But without better understanding of himself and his

society misuse of his understanding of nature is, as experience shows, almost certain and to-day it is fraught with possibilities of disaster.

The building up of the social sciences requires a shift in the direction of human effort in the intellectual field. How can that shift be brought about? The purpose of this article is to suggest that it will come about most rapidly and most rightly if it is attempted as a new development of science. This means that the leaders of natural science are asked to-day to do two things: first, to favour the devotion of more money to social science even it it means less for natural science; second, to realise that the social sciences are not the same as the natural sciences. Men are not fruit flies. The direct incursions of physicists, zoologists and botanists into economics, politics or the study of human populations without previous mastery of the necessary techniques have seldom been happy. Science in all fields is specialisation.

Mathematicians, physicists, chemists, physiologists are not, as scientists, to blame for the misuse which mankind makes of their discoveries. But they are men as well as scientists; in both capacities they can help to-day to make misuse less likely in the future. One of the encouraging developments in the United States has been the determination of physicists concerned with splitting the atom to concern themselves also with the political measures needed to prevent this latest discovery so rich in promise of good from unlocking instead the door to disaster. But much more than emergency political action is needed. Our growing security against natural disasters rests on knowledge of nature. Security against disasters springing from man and his social institutions must rest equally upon knowledge. And the knowledge required is knowledge in a new field, won by an adequate expenditure of resources, material and human.

There is need to-day for a League of Natural Scientists determined to further to the utmost of their power the advancement of the social sciences.

A WIDER OUTLOOK

By Sir Richard Livingstone
Vice-Chancellor, University of Oxford

The subject of this discussion is the humanities and the sciences in the British Universities. By ' the sciences ' I shall mean natural science, mathematics, technology and medicine ; by ' the humanities ' the rest. I do not defend this nomenclature : but it is convenient.

It is a two-way problem : to see that both humanists and scientists, while specialising in their own subjects, at the same time get the wider education which they need as men and citizens.

I shall leave others to speak of the needs of the humanists, because I think it is a good thing for us to get a chance of seeing humanistic education as the scientists see it, and I shall only say a few words on this point. One can, of course, live comfortably without any knowledge of chemistry and physics and biology, as one can enjoy health without any knowledge of medicine. On the other hand, to know nothing of science makes the world less intelligible and life less interesting. That is the ideal argument for some knowledge of science.

But there is also the practical argument. To be ignorant of the place of science in civilisation is to be ignorant of the existence of powers whose help we may need, and this, especially in persons holding public positions, may be disastrous. It is not necessary for the ordinary man to be a doctor, but he must know that doctors exist and be prepared to call on their services. Although he need not be a scientist, any educated man must know that there is such a thing as science and realize the occasions for calling it in. Perhaps this is best achieved through a study of the history of science. The indispensable thing is to know the impact of science on civilization.

Humanism and the Science Specialist

Now let me turn—subject to correction—to the place of humanism in the education of the science specialist. The centre of his studies and his future life work lie in a field of knowledge already vast and continually expanding. It is obvious what claims this makes on his time. Yet even as a specialist he needs to know something of French and German and to be able to express himself clearly in English.

As a man he needs a wider education than science by itself can give. To be ignorant of literature and art is to be ignorant of the only immortal human creations. To be ignorant of history is to be ignorant of the adventure of mankind in the world, with all its interest, instruction, warnings and encouragement. In fact, to be ignorant of history, literature and art is to know very little of man.

An education with these defects produces mere technicians; by a mere technician I mean a man who knows everything about his subject except its ultimate purposes and its place in the cosmos. We produce too many technicians in this sense of the word. And the mere technician, though invaluable as a tool in the hands of others, is unequipped to take a directive part in society and politics. His education has not trained him to understand or deal with human beings. Man is, no doubt, a complex of cells, of elements, of atoms: but we may know everything that is to be known about these and know almost nothing about him. There is also another side to man. He is, as Newman says, 'a being of genius, passion, intellect, conscience, power. He exercises these gifts in various ways, in great deeds, in great thoughts, in heroic acts, in hateful crimes. He founds States, he builds cities, he rules his kind. He creates vast ideas'. Some knowledge of these aspects of him is essential to those who wish to understand the human problem and take their share in tackling it. When we misuse the gifts of science, it is not the scientist in us who misuses them, but the man.

Early Specialization

How far do we give the schoolboy who specializes in science the necessary background and supplement to his specialism? Let me refer to a personal experience. I was talking recently to two candidates for science scholarships. When I asked them how much time they had given in their last school year to subjects other than science and mathematics, each said 'None'. These were, admittedly, exceptionally bad cases, but not unique. The disease, in less extreme forms, is endemic in our education. It is rare, in my experience, to find science or mathematics specialists in secondary schools giving as much as six periods a week to any except their main subjects. It is instructive and painful to contrast the time-tables of the scientific

and mathematical sides in our schools with the time-table of the old German *Oberrealschule*. In these schools the highest form gave eleven periods out of 31 to science and mathematics and 20 to other subjects ; and this balanced education in no way injured the quality of German science.

How are we to explain a state of things which is generally admitted to be deplorable ? The ultimate cause is the absence of a clear idea of the purposes of higher secondary education. There is an educational theory behind the school certificate, even if the theory may be imperfect and the certificate in its present form undesirable. But when the School Certificate has been passed, educational theory collapses before the imperious pressure of scholarship examinations, especially in the smaller schools and with boys whose whole future in life depends on their winning a scholarship. Oxford and Cambridge, with their highly specialized scholarships, are the worst offenders, and they tend to dominate the schools. The examiners are concerned only to pick the ablest scientists—a very natural and proper aim ; and this, I imagine, their methods achieve. Whether these methods produce educated men they do not regard as their concern.

The Reform of University Scholarship Examinations

What prospect is there of improvement ? We must alter the curriculum in the schools. Much may be done by a four-subject school leaving certificate as proposed in the Norwood Report. Such an examination, provided the subsidiary subjects are in a different field from the main ones, should prevent excessive narrowness of study. But unless university scholarships are also reformed, these will continue to be a powerful narrowing influence. I think that the Scholarships in Modern Subjects, which are now awarded by a group of five Oxford Colleges, offer a useful model. They have two important features : first, there are two general papers, to which much weight is attached ; second, and even more important, every candidate (with unimportant exceptions) must offer two from a list of 13 subjects. Latin and Greek are one subject on this list ; natural science is one subject. No candidate can take natural science and mathematics as his two subjects, though a mathematical paper is one of the two papers set in natural science and can be taken by those who

offer that subject; no candidate can offer more than one modern language; and the historian must take some subject other than history. The result is that a scientist, a classic, a mathematician, a historian, a modern linguist, must take a *main* subject outside his special interest; and, unless he does creditably in his general papers, he is unlikely to be elected. I do not know that the word ideal can be applied to any examination, but this one has as much claim as any to the epithet.

This scholarship group has been in existence for a number of years and its results have been satisfactory. It attracts many candidates, chiefly from the smaller schools—the curriculum of the big schools is dominated by the normal specialized scholarship. Nevertheless, so far as secondary education is concerned, we should get rid of excessive specialization if all scholarship examinations were remodelled on these lines. And if, when boys come to universities, their interests are reasonably wide, our problem is partly solved.

The Claims of Philosophy

But not entirely. It is not enough to free the schools from the baneful influence of our present scholarship system. There is a problem in the universities themselves. It is not enough for the humanist to do some science or for the scientist to do some history and literature at school and feel that sufficient incense has been burned at these altars. At the undergraduate stage appears a new claimant, the august figure of philosophy.

How are we to find room for these subjects in the university curriculum? Here I should say something about the proposal for a general degree course—both Honours and Pass—in the natural sciences and the humanities. [1]Its ultimate aim is, in Professor A. N. Whitehead's words, to ' construct a system of ideas which would bring the aesthetic, moral and religious interests into relation with those concepts of the world which have their origin in natural science ' and ' to fuse religion and science into one rational scheme of thought'. Those words perfectly describe our need and our final goal.

But this new course will not by itself solve our problem. Its

[1] Suggested by The British Association Committee in *The Advancement of Science* III. 9 p.14.

subject is difficult and will only appeal to the better student. The science specialist will not take it. It will have little commercial value for those who wish to teach, and they will continue to be attracted to courses which contain the subjects of the normal school curriculum. There will remain a majority who are occupied with their own specialisms and still require the broadening of outlook and interest needed to complete these. How are we to give them what they ought to have?

Let me put, briefly and dogmatically, my main contention. What the world most needs, and most lacks to-day, is a clear and worthy view of life. A hundred or even fifty years ago such a need was not so imperative: public opinion, a powerful system of accepted conventions, acted almost as a philosophy of life and controlled the mind and conduct of all except the rebellious or the very weak. That time has gone and left us to find our way in a twilight of uncertain and conflicting opinions. To find it we need, I repeat, a clear and noble view of life. What do we do to give the undergraduate such a view? I think we must reply "little or nothing".

Where is one to get it? What—so far as it can be got from study—are the sources of a view of life? It appears, like grains of ore in their matrix, scattered through history and literature—more abundantly in literature than in history—but in both cases needs careful extraction and may even escape notice. In religion and philosophy it is found pure. Of these four subjects, philosophy is not really suitable for schools, even if there was time for it in the curriculum. Literature and history are commonly neglected by science and mathematical specialists, and drop out of sight altogether at the universities. As for religion, in the restrained words of the Spens Report, 'there is a considerable number (of secondary schools) in which the subject is not included in the time-table of the higher forms'; at Oxford and Cambridge its existence is recognized by the provision of college chaplains; in the modern universities it is left to private enterprise.

The least we can do to make it easier for the undergraduate whose degree course does not involve the study of literature, history, philosophy and religion, to keep in touch with some or all of them.

How is it to be done? Something might be affected by encouraging students to attend lectures outside their faculties. That was the

practice of German universities, where the most distinguished professors commonly gave a publicum—a course of lectures in their own subjects but designed for the non-specialist. They were very well attended—I have seen 600 people at a 7 a.m. publicum given by Harnack. Whether they would be equally successful here is less certain : the German university system with its *lernfreiheit* encouraged independence in the student more than our prescribed curriculum does. The more intelligent and enterprising we encourage our students to be, the more likely they are to browse outside their specialism. It would be an excellent plan for universities to issue terminally a lecture-list giving notice of lectures in the subjects of the various Faculties which are suitable for non-specialists.

The Study of Philosophy Compulsory

But I hold that we should take more decisive measures. If we think that a man is not properly educated unless he has reflected on the major problems with which philosophy deals and has some idea of the most important answers given to them, we must make this study a condition of obtaining a degree. In short, if I was an autocrat, I should make philosophy a compulsory subject in universities : by philosophy I should mean moral philosophy together with *either* logic *or* the theory of knowledge. I would make it possible, but not compulsory, for everyone to take religion and the history of science in his degree course.

There is nothing new in this suggestion. It is made in J. S. Mill's great address on *University Education.* But how can we find room in our university courses for a compulsory course of philosophy and for optional courses on religion and the history of science ?

It might be said that our difficulties are due to the change in the meaning of a word. The distinction between science and humanism would have been meaningless to a Greek. To him, science was epistémé, ' knowledge', a whole with many parts, all of which were a concern and an interest to men. It is too late to recover that Greek use of the word science (though it would save us from many ambiguities in the use of phrases like a ' scientific outlook ' or a ' scientific attitude to life '). But it would be well if we could recover the Greek attitude.

SCIENCE AND HUMANISM

By Professor J. D. Bernal

For many years now a division has been established in our universities between the sciences and the humanities. This division is probably more absolute now than it has ever been before, because it is practically impossible for a student to study subjects in both fields simultaneously, and the number who study them successively is negligibly small. This division is probably worse in Britain than in any other country in the world, because we have, for historic reasons, chosen to limit what we call the sciences to what are more properly called the natural sciences, excluding considerations of human society, however scientific, whereas almost everywhere else the conception extends to all aspects of human knowledge which require the discipline of scholarship in their interpretation.

We are as citizens now engaged in an attempt to supersede the chaotic and inhuman competition of earlier days by a democratically planned community. This makes it all the more necessary to have among those who will administer and direct this transformation men and women whose knowledge of the universe is comprehensive and not one-sided. For this reason the separation of the training of these men and women into water-tight compartments is not only deplorable but dangerous, and it is one of the most serious and urgent problems of the universities to look for ways of ending it.

This great division of human culture can be traced back to the beginning of civilisation. It was then that the primitive unity between doing and talking, things and thoughts, began to break down with the division of society into rulers who dominated men by words of power, and mechanics who worked with their hands to produce food and goods.

This distinction was consecrated in classical and mediaeval times as that between soul and body, spirit and matter. All true wisdom and profitable learning were confined to the first categories. It was only with the Renaissance, when interest in the body and works of the hands showed itself in the arts and manufactures, that a new Scientific

culture arose to balance the old Humanities. The first fully explicit expression of the new tendency, with its emphasis on the power of knowledge to improve the material condition of man, came with Francis Bacon. Soon afterwards, however, Descartes introduced a speciously logical separation of knowledge into that of matter and spirit, the first becoming the proper field for the scientist, the latter preserved for the theologian and humanist. This face saving distinction was to plague science and philosophy from then on.

Strangely enough, the man who saw through it was the Neapolitan Giambattista Vico, standing right outside the main stream of European thought. The division he made in his New Science was not between matter and spirit, but between the world of nature and the world of man. This world of man included not only history and philosophy, but all the arts, and, as he stated boldly " because it is made by man, it can be understood by man ". This is the foundation of scientific humanism. Vico's ideas, though slow to spread at first, were to have a momentous influence. Through Michelet, they influenced the study of history, and later, through Hegel and Marx, they came to provide a new concept of the function of man in the universe.

Nevertheless we must admit that, in this country at least, the Cartesian dualism and its parallelism in the cultural field, the distinction between the sciences and the humanities, has provided the basic thought pattern on which education has been moulded. It is a profoundly unsatisfactory pattern, because it can only be sustained either by ignoring, on the side of science or of the arts, at least half of human experience, or, if an attempt is made to combine them without unifying them, by the obligation to maintain unrelated compartments of thought and consequently to split and diminish the human personality.

The unitary view, on the other hand, largely because the whole trend of teaching is against it, is much more difficult to achieve ; nor has it yet acquired a fully explicit formulation. Nevertheless it is a view on which are converging the dominating tendencies of the arts and sciences of our time. We are coming to see both as social modes

—the arts more concerned with communicating the more immediate and emotive social drives: the sciences providing through analytic understanding of nature the means of using its forces for social purposes.

Both are parts of a continuous human tradition. Artists influence each other; art forms are created flourish and die. The product of art can be divided into schools dominated by some new form of expression. But the tradition of science, is all this and more. It is cumulative—it is not a series of successive expressions. It is one total expression of human knowledge; an expression that has continually to be revised and reformed in detail, but one where, with every change and pruning, the stock remains more secure. It is because of this cumulative nature of science that the work of the individual is less regarded. He may be honoured, but he is not read. It is the individual work of the great artist, on the other hand, that survives. The artists are in a sense all contemporaries, while the scientists are successors.

The major difficulty in the way of establishing closer relations between science and the humanities, and of viewing them as part of a union of human knowledge and achievement, is this mixed character of both disciplines. The fundamental distinction between the scientific and the aesthetic mode is apt to attach itself to the practical distinction between the fields of natural and human experience in which both modes can be exercised. This applies even more to teaching than to research or appreciation. The teaching of the humanities has a very old established tradition, a tradition probably quite continuous from the times of ancient Egypt and Babylon. The methods have been gradually modified, but old principles and lines of division still remain. The starting point of the humanities is literary, the ability to read and write, and particularly the ability to read and write in the sacred languages. The aim of a literary education has been effectively the acquiring of traditional culture by the methods of scholarship, and the teaching has necessarily concentrated more on the method than on the content, because many lifetimes are really required to absorb the content of culture, whereas there is some reasonable hope that the methods of

scholarship by which the content can be reached might be acquired in a few years.

To this old core of literary scholarship has been grafted at various times, in the days of Periclean Athens and later in the Renaissance, an entirely different educational aim, that of producing the citizen or gentleman ; an education largely in manners and attitude, in which a knowledge of ancient models is taken to play the chief part. A great deal of this type of education depends on its common acceptance —the right thing to do and the right thing to say is the thing that the best people of the time have the habit of doing and saying. Education itself becomes the hallmark which it is impossible for the uneducated to forge. Now the full value of this type of education was disappearing even in the nineteenth century, and it showed its last efflorescence in the days before the first world war.

With the passing of the gentleman as born ruler, the liberal education of the gentleman lost its object. But the loss of an object is no deterrent to an educational system, which has an inertia demonstrably greater than almost any other human institution, even the laws and the Churches. Euclid's elements have held undisputed sway among school teachers from 300 B.C. to the present day. And of course it is also true that an education ideally aimed at producing gentlemen was, in fact, during most of its course, producing minor lawyers and clergymen. Now, with the prevalence of popular literacy, the educational system itself becomes largely the objective of humane education. Teaching is aimed at producing teachers. The means and ends in the humanities are by now hopelessly confused. There was a time when it was very conveniently believed that learning itself was a valuable discipline, training the mind and strengthening the memory, and the uselessness of the thing learnt was of additional value because it proved the disinterestedness of the scholar. The excuse has gone, but the habits persist. What has happened in fact in the humanities is a gradual and reluctant abandonment of the purely classical tradition, and the extension of its methods to cover modern studies such as history, economics and literature.

The course of scientific education has been very different. In the

first place until the nineteenth century it was essentially a voluntary education, where people learnt for themselves, either because of a passionate curious interest, or for expected benefits. Medicine, which began being taught as a humanity by lecturers who could not sully themselves by actually touching patients, only later acquired the status of a scientific study. But the object of science was ostensibly successful practice, and, if possible, advancement of science itself. The content predominated over the form. There was little claim to build characters, but rather to produce adepts. Naturally when it became part of the curricula of schools and universities many of the vices of the older education gradually introduced themselves into scientific teaching. Nevertheless there always remained the test of practice and the intrinsically revolutionary nature of scientific teaching, inculcating doubt in tradition and reliance on direct observation and experiment. The real weakness of the scientific education, particularly in England, was its extreme narrowness. This is in part a legacy from the fact that science had its birth in England at a critical period in our national history, just after the conclusion of the struggle between King and Parliament. It was natural then that subjects of division and controversy should be omitted from the new science. As Hooke put it: "Not meddling with Divinity, Metaphysics, Moralls, Politicks, Grammar, Rhetorick, or Logick." Unfortunately, owing to the inertia of human institutions, particularly when confirmed by charters and endowed with venerable attributes, this distinction has been allowed to remain long after its utility has passed away. Limited as the fields of scientific research are, in education science has become even more narrowed into mathematics, physics and chemistry, and a very much weaker branch in biology, for the most part attached to medicine. What this now meant was that while humane education wasted a great deal of time on comparatively trivial grammatical and linguistic skills, it did aim at a comprehensive, if traditional and wrong-headed, view of the totality of human experience. Scientific education, on the other hand, gave a much more accurate and progressively approximating view of an extremely limited field. What was worse, of course, was that what was left out in scientific education was what most concerned the student as a person—the knowledge of

society and its history, of philosophy, art, religion and morals.

This vacuum could be filled in either of two ways. The conventional way was to leave the scientist to accept the views traditionally held in the society in which he had grown up, but—and this is the important point—to leave him to accept these views before he was formed by education or rather with an education that in general did not enable him to criticise them. This put him at a disadvantage compared with the art student as a human being and a citizen. The other alternative, available only to strong spirits, was to attempt to apply the principles of scientific method to other fields of experience, usually leading to a complete rejection of tradition and to a nihilist or at least agnostic attitude towards beliefs which could claim no other support than the authority of tradition. To take such an attitude demanded much more moral courage, and was therefore accepted by few. It also demanded from each individual the almost impossible task of assessing for himself, without the guidance of tradition, the full relations of man to society. Only if the scientist had the leisure and inclination to be a humanist as well could these difficulties be overcome, and even then it was much more probable that the extremely difficult effort of harmonising the humanist and scientific traditions would not be made, but rather they would be allowed to grow together as completely different parts of the personality. Very few, even of the world's greatest scientists, got as far as this. Leonardo da Vinci probably did. Newton and Faraday certainly did not. On the humanist side, the efforts were even rarer. Goethe gives the nearest approach to a humanist who tried to assimilate science, and his science was so coloured by his emotions that it had no effect on the general stream of scientific thought.

The integration between the scientific and humanistic viewpoints is, however, something which should not be a problem for the isolated human mind, even for the greatest of them. It may be something which will work itself out in practice in the need to meet and solve the very problems that the disharmony itself creates. This was the way which Marx, himself a humanist turned scientist, saw it in the nineteenth century, and the way in which it is working itself out in country after country in our own time. Education, if it is to rise to

its task, must attempt to bring these aspects together. This is not to be done by preaching any cut and dried philosophy; still less by reverting to the teaching of philosophic and religious views long outgrown and irrelevant to our modern world. On the contrary, the joining of the two streams of human culture is something for the future, for which we can prepare in education by bringing together in the minds of the new generation the different aspects of the picture, and leaving it to them, first unconsciously and then consciously, to provide the necessary fusion. What we have to do is to design teaching so that the various aspects of human knowlege and human feeling are presented fairly in a balanced way, and with due indication of their interrelationships: that means, naturally, including in education the presentation of interpretations and attitudes about the major current problems, but allowing them to appear as they really are, as debates and not as dogmas. It is, for instance, astonishing that in our universities nearly a hundred years after the appearance of the Communist Manifesto there is no official presentation of the Marxist philosophy, one of the major factors in the thought of our time. The result is not that we have fewer Marxists in the universities, but that the real business of serious education goes on outside and not inside the lecture room and tutorial.

Bringing the vital subjects of our time into debate in the universities will help to emphasise the range of necessary knowledge without which they cannot even be grasped. Most people of our time, even the most learned, are in fact grossly uneducated; that is, they are completely ignorant of large sections of the common heritage of culture. They neither know the facts nor the languages in which those facts are expressed. We must at least attempt to provide this background to all our university students. What it is has been adequately put forward by Professor Dobree in the Universities Number of the *Political Quarterly* (Vol. XV, No. 4, 1944). The educated man, he says, "should know something of six different though interconnected realms of intellectual activity: (1) The physical structure of the world he lives in; physics and astronomy; (2) what sort of animal he is, what made him what he is, and what the conditions of his survival are; biology: (3) what has happened

to the human race in the past, that is, the large movements; history: (4) by what ideas and organisations the human race lives; anthropology, psychology and sociology: (5) the ideas concerning what it is all about (the basis of values); religions and philosophy: (6) human achievements in literature, music, and the plastic arts." These he claims as the basis for humanities; but humanities so interpreted would remove the need for separate faculties of science. I think that there is still a need for both faculties, but that they should have this basis in common and differ only by the emphasis they give to different parts of it.

If, then, we can accept such a programme as a basis for university education, how in practice will it be possible to fit it into existing overloaded curricula? I feel that the demand to solve this problem, just because of its difficulty, may force its own solution. We cannot teach scientific humanism unless we are prepared to cut down drastically the amount taught in practically every field of teaching. The demand for an extra subject may be the straw that breaks the camel's back. In one academic field after another complaints have been growing more and more insistent for far too many years that most of what is taught, in science and arts faculties alike, is out of date, superfluous and generally futile. We continue to teach it out of that scholastic inertia, fortified by the examination system, which is now probably a worse drag, in a rapidly advancing cultural world, than at any previous period in educational history. Because the curriculum is overloaded, because the teachers are too few and the classes too large, no one has time to think of what they are teaching, and consequently we all go on teaching the same things over and over again. Is it not time to stop and definitely to reconsider and revolutionise rather than merely to revise the whole field of studies? We have to break the old and vicious custom practised in science and humanities alike by which new knowledge of recent discoveries in science, or recent additions to literature or the arts, are tacked on at the end of an old curriculum, which is then squeezed so that some of the older and more useless bits gradually decay and fall off.

In science at least we can see now that our presentation of whole subjects, such as physics, could be enormously simplified and

shortened by thinking out, in the light of the most recent knowledge of relativity and quantum theory, how to present the older and apparently simpler parts of physics. Already abroad, notably in France and Holland, this has been done. There is no longer any division into heat, light and sound, electricity and magnetism; but the general principles of moving and vibrating systems are taught and illustrated by appropriate examples from optics, electronics and mechanics. In chemistry the situation needs even more drastic modification. The old chemistry was largely a matter of memory, a set of cookery recipes that had, for no apparent reason but to worry the student, to be learnt by heart. The new chemistry, based on the atomic theory, is, on the other hand, logical, and makes no such demand on the memory. In the biological subjects we are still plagued by the existence of branches of the subject such as zoology, botany or physiology, that have no logical reason to exist in the light of our present much more generalised knowledge of common biological functions. If we can find the men and money to work out new syllabuses in the natural sciences we could probably get a much better picture of the world of nature with far less call on the memory and far more stimulation to imagination and interest, without losing a bit of the practical capacity which it is still the aim of professional scientific education to achieve.

I have no such knowledge of the changes that would be necessary in the humanities, but it appears from statements made by humanists themselves that the situation there is not much better. There is much taught for which the only reason is that it was taught before, and the divisions between the subjects themselves also justifiable more on historic than on present-day grounds. In both cases the trouble is that it has been nobody's business to look into the curricula in a serious and purposeful way. Teachers are too busy teaching; University organisation is too rigid; the examination systems make too many demands. All that is achieved are piece-meal changes in curricula which generally leave them heavier and more complex than before. What we need are appointed whole-time university commissions to revise the curricula, not according to their opinions but according to careful operational research both on the justifications

of the existing curricula and the effects of the teaching in the subsequent work and life of the students.

Essentially, what we are aiming at in both arts and science is to reduce the amount of learning in order to be able to increase the range and depth of understanding. To the science courses, so cut down, we would want to add enough of the humanities, particularly history and philosophy, to understand the importance and significance of science in human culture; to the arts courses, a corresponding amount of basic science. At first this would be very difficult to do. The absolute gap of ignorance between these fields of learning is so great that there are very few competent either to teach humanities to science students or science to arts students.

Nevertheless the effort is worth making, and will, I am sure, in the end succeed. But it must be accompanied by a more complete interpenetration of subjects. If a scientific student, for instance, could be assumed to know the outlines of cultural history, the whole of his science courses could be interspersed with detailed allusions to the historical origins and consequences of every scientific discovery about which he learns. How far analogous scientific allusions in the arts would be effective I am not so certain. Here the picture is not symmetrical. In many fields of the creative arts, the historic cultural level has not yet reached into the period of the Industrial Revolution, and therefore the impact of science is not really felt. But at any rate in works produced in the last twenty years this has ceased to be so, and it is, after all, in the consideration of contemporary culture that it is most necessary to stress the unity of our culture.

These methods, taken together, will still only begin the process of unification. To be effective they need to be supplemented by a more active and personal collaboration. The experience of the war has taught us, in the widest field of science, the enormous value of the small mixed research team; one composed, say, of a physicist, a biologist, a psychologist and an economist. These men, working together on a common problem, were able to understand each other's approach and methods in a way that no former teaching could approach, and the concentration on the achievement of an object gave

a concreteness which fixed this understanding in a way that no purely academic exercise could do. Now what was achieved in practical operational research in the field of science in war might be achieved equally well in the still wider field by analogous methods in peace. We must strive to find concrete projects on which staff and students of different faculties can work together. Such problems have already been furnished by the work of the regional surveys which were carried out in many British cities both before and during the war. The problems of reconstruction after the war offer even more opportunities for similar projects. The question of housing, for instance, is one which involves every single subject that is included in both faculties, from theology to chemistry. Houses are not only made of bricks and mortar, they are part of the tradition of British history ; they do not stand by themselves, but as units in the social complex of the neighbourhood ; and the reactions of their inhabitants provide a fascinating field for applied psychology. Why can we not find room in our curricula for the undertaking by staff and students together of such general projects ? It is there, in examining and studying real practical difficulties, that the varied human and scientific disciplines could become effectively mixed. It is there that the student could receive a foretaste of the experience which he is bound to receive when he goes out into the world.

The fusion between the arts and sciences is, I hope to have shown, both desirable and possible. In conclusion, I would like to emphasise that it is also a vital necessity. It has seemed to many in the last few years a sad paradox that while man's powers of understanding have everywhere increased, we should find ourselves in a state of want, dissatisfaction and justified apprehension which has not been felt, at least by the upper classes of society, for over a hundred years. To shallow minds which can only see one thing at a time, science is made to be the single cause of our troubles, and it is asserted that man's moral nature is not competent to deal with the vast powers which his intellect has put at his command. They foresee doom, and demand, without either considering it or really expecting it to happen, that we abandon our knowledge and relapse into a pious and mystical ignorance. The alternative to this attitude comes from

the realisation that we are at this present moment of time at a particularly critical stage of a transformation that began some hundred years back and may go on for some scores of years into the future.

The characteristic of this transformation is not the existence of machines or atom bombs, or even of science itself. Partly as the result of these developments, but more fundamentally because of the economic and social processes that are largely responsible for them, we are moving towards an era where conscious co-ordinated human activity on a world scale will take the place of the unconscious and unplanned interaction of separate human wills and desires. As for the individual, so for society, ignorance and irresponsibility go together. Only if we have no means for knowing the consequences of our actions can we claim to be excused responsibility for them. It is no excuse to pretend not to know once the knowledge is there and all we have to do is to find it out. In the Soviet Union for nearly thirty years, and in this country during the years of the wars, we know what it means to have a whole society run by conscious and democratic co-operation for a clear and common end. That knowledge carries with it an immense responsibility—a responsibility on every member of the society not only for his own behaviour, but, in so far as lies in his power, for the conduct of the whole society. It is not surprising that many would wish to shirk this responsibility, to pass it off on to the shoulders of Divine Providence or iron laws. But if we do not shirk it we must learn to understand what it implies. The negative implications are clear enough—the placing of private before public interest is a waste and a nuisance, and may become a crime. But the positive implications are both more important and more difficult to achieve. To be a citizen in the new world, merely to do one's duty is not enough. The conscious world cannot be made to work either by set rules or by orders from above. Our opposition to the totalitarian state or to the Fuehrer princip is not only that it is a diminution of human capacity merely to obey orders, but, more seriously, because a population that merely obeys orders puts demands on those that have to give the orders which no actual or conceivable human being could adequately fulfil. The disaster of Nazism was not caused by the fact that Hitler was mad, but by the very position he

occupied and by the philosophy of the state that he so absolutely ruled. The new responsibility of the citizen is to understand his place in the world and to act with others in the light of that understanding. Now the understanding need not be a very great one. It must adapt itself to the capacities of every one of us. But great or small, it needs to be balanced. It needs to include the basis of practical and material as well as social and emotional knowledge and appreciation. Some may have more of one, some of the other. But all must have enough of both to be able to understand each other's language and to collaborate in the same tasks. It is for that reason that the union of science and the humanities is for us a condition of survival.

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THE GENERAL EDUCATION OF SCIENTISTS

By Harry J. Carman
Dean of Columbia College

In the February, 1947 number, Professor R. A. C. Oliver initiated an interesting discussion on general education at University level. The following article pursues this discussion by setting forth in somewhat summary fashion, the experience of Columbia College in the general education of the scientist.

Columbia College is one of more than a dozen schools and colleges which together comprise Columbia University. It is the undergraduate college for men with a student body of normally two thousand. The College is independent of, and yet closely articulated with, the other parts of the University. It provides a programme of undergraduate study in the liberal arts leading to the degree of Bachelor of Arts. In the first two years, which are described as the Lower College, the work consists principally, as Professor Oliver indicates in his article, of broad foundational courses in the major divisions of study : science, social science, humanities. A reasonable proficiency in English and in at least one foreign language rounds out the curriculum of the Columbia man's two beginning years. He learns that written and spoken English are a part of every course he studies and an important element in all his relationships. He must be able to converse as well as read in the foreign language he elects, and, if he likes, he may take in his freshman year an intensive elementary course of which five hours a week are occupied by oral practice, in all groups, under a bi-lingual or foreign instructor.

In the junior and senior years, which are described as the Upper College, the doors of almost three hundred and fifty elective courses swing wide. As a consequence the student may build one large pillar of knowledge or several small pillars—but he must always build. He may concentrate in the field of his major interest leading probably to a profession, or, if he prefers, he may carry on intensive study in two or three related fields, or he may, under guidance, broaden his efforts even more widely. A student in the Upper College is permitted to elect approved graduate and professional school courses for which he has aptitude and is prepared. Seminar and sequential courses are

available for those wishing to specialise. In both the Lower and Upper Colleges stress is laid upon quality rather than quantity.

As far as the general education of the scientist is concerned the Faculty of Columbia College believes that his general education should not differ fundamentally from that of the non-scientist. Everyone will admit the prestige of natural science as a superb instrument in the service of industry. But many persons who regard themselves as well-educated confuse science and technology, and tacitly assume that the aim and sole justification of science is its application to such specific matters as the things we make and use, and the way we conduct war. Indeed, this point of view is expressed not infrequently by scientific workers themselves.

Moreover, it is generally believed that the triumphs of modern science have been made possible only by the use of highly specialized techniques, developed in the context of researches involving an extraordinary degree of departmentalization and division of labour. Accordingly, it is often assumed that competence in the sciences can be achieved only at the price of limiting the range of interests of workers in scientific fields—a price which is sometimes taken to involve the creation of a group of men who know little about things outside their speciality, and who are incapable of evaluating the significance of their knowledge and labours in terms of human welfare.

These judgments—that theoretical science is primarily a servant in the employ of technology, and that success in science is the product of an intensely narrow specialization—have to a large extent determined the content and character of scientific instruction in the secondary schools and colleges of America. In fact, the sciences have been generally taught with one or the other of the following objectives in mind: to make students familiar with a certain amount of factual material, introduced simply as the unquestionable conclusions of scientific research, which is of interest and use in the practical problems of daily living; or to develop in the student a set of highly specialized skills, in preparation for a career in pure or applied science.

More than ten years ago the Faculty of Columbia College reached the conclusion that these judgments and the consequences which have been drawn from them required reconsideration. In the first place science is not simply a body of miscellaneous conclusions whose

significance is exhausted by their relevance to immediately practical issues. Science is also a method of inquiry, a way of handling ideas boldly and critically, so as to yield a comprehensive understanding of nature's processes and human destiny, and has contributed to the development of free and liberal minds in at least two essential ways: it has tended to emancipate men from local prejudices and the domination of unexamined traditional beliefs; and it has supplied men with ideas and theories which could serve as permanent materials for intellectual enjoyment because by means of them men can achieve intellectual mastery over various processes of nature. In consequence, an especially distressing feature of much current science teaching is that it conceives its primary task to be simply that of disseminating special conclusions of scientific inquiry as so much miscellaneous but unrelated information. Little has been done to develop in the student a sense for the intellectual temper and the moral discipline with the help of which such conclusions have been obtained.

Doubt has often been expressed whether, in the face of the cumulative increase in specialized factual knowledge, it will be possible for anyone in the future to acquire mastery over more than an insignificant sector of some subject-matter. But the actual history of the sciences does not, in the opinion of the Faculty of Columbia College, encourage such melancholy doubts. To be sure, as the frontiers of knowledge are extended, familiarity with special factual details is enlarged, and it becomes more difficult for any single individual to be expertly acquainted with all the details thus discovered. Nor can it be denied that as the natural sciences extend their scope, a larger number of often difficult techniques must be instituted, techniques which cannot be all acquired during any one life-time. Nevertheless, in virtue of the development of comprehensive systems of principles whose province tends to extend over progressively larger areas of special fact, it becomes less important for a scientist to become a master of a miscellany of factual minutiae. Indeed, it becomes more rather than less easy for men working in superficially heterogeneous domains—as for example, in physics as distinct from chemistry, in chemistry as contrasted with biology—to understand the special problems of their fellow workers and even to contribute to their resolution. Different subject matter which

appear initially as unrelated, is frequently discovered to be subsumable under a relatively small number of comprehensive ideas. Accordingly, instruction in the sciences which emphasize the diversity of special facts and techniques, is, in the opinion of the faculty of this American college, likely in the long run to handicap rather than advance the student preparing himself for an effective scientific career.

The problem with which the Faculty of Columbia College has wrestled and continues to wrestle is to sift out from the wealth of scientific knowledge now available certain connected portions which will lend a broad significance and direction to the more specialized knowledge which a man must acquire as part of his specifically professional training. Our problem is not that of making everyone familiar with just those phases of the world which are directly relevant only to a selected group of activities—even if, largely because of historical accident, those activities are generally arranged under the honorific label of " liberal profession." We feel that the curriculum of a liberal college must give its students training not only for the sake of acquiring competence in a specialized field of activity, but to make its students sensitive to the full range of human aspirations.

As Professor Oliver pointed out in the last issue of the *Universities Quarterly* and as I have already mentioned, the first two years of the Columbia College programme are devoted to general education. Every student, no matter what his objective may be, must meet the course requirements in the three basic fields: science, the social studies and the humanities. The young man looking forward to being a scientist as well as the young man planning to be a lawyer or a journalist or something else is confronted with these broad but difficult introductory courses.

The first of these, " Introduction to Contemporary Civilization " has been briefly described by Professor Oliver. By way of supplement may I add that every college should avoid graduating social and political illiterates even though their special interest may be in the natural sciences. The Contemporary Civilization course has both breadth and depth and is functional. History is its combining principle. Too many of our American educational institutions in their zeal to make education " significant," to have it concerned with

" public affairs " and come to grips with pressing issues of our time, have insisted on concentrating on events of the day and forgetting about the " dead past." No one can quarrel with those who would make education more functional and have us better understand the insistent problems of the present. Yet I would not want those who emphasize what, for want of a better term, I call the "dominion of the immediate," to forget that the world of to-day is the result of an historical process ; we are the past embodied and acting under new circumstances. That part of the past which is still alive in us must be studied in its origins before our motives and desires can be fully understood. The really educated person, whether he be a scientist or not, should know as much as possible about the development of modern man and his institutions. He should know why and how representative democracy was developed, under what handicaps it has laboured, what theories have been held concerning it, what obstacles must be overcome that it may continue to function.

The need for the humanities is no less real than for science and the social studies. Philosophy, literature, music and the arts deal with morality. Philosophy and literature deal with it directly ; in fact they deal with little else. Music and the fine arts deal with it indirectly. There is no better way of getting young people to think about the moral life—the life of right action and right feeling—than through the study of the humanities. They provide an anchorage in adversity. To know how strong, courageous, and exacting the human spirit can be is to possess a truly fortifying knowledge. One person may get this knowledge from Greek architecture, another from Shakespeare, yet another from Mozart, and still another from an Emerson or a Walt Whitman. This very diversity of human fineness is in itself a thing of the greatest educational importance. Indeed, it is the fundamental assumption upon which democracy is built—the perception that the human spirit can take innumerable good forms. Nothing can teach this better than the arts.

The first year of the Humanities course is concerned with reading in whole or in part, in English, thirty great books ranging in difficulty from the winged narrative of the *Iliad* to the forced marches of Spinoza's *Ethics*. The second year is devoted to the fine arts and to music. The course, as my colleague Professor Jacques Barzun

points out elsewhere[1] rests on a series of related assumptions: first, that a college granting the Bachelor of Arts degree should not merely pave the way to professional training, but should try to produce educated men. Second, that if educated men are those who possess an inner life of sufficient richness to withstand the slings and arrows of fortune, they must have learned to feed their souls upon good books and pictures, and music. Third, that the memorizing of labels, catchwords, and secondhand judgments about art and books is not educative in any real sense. And lastly, that to know and to be at home with books a man must at some time or other read them for the first time.

In many respects the techniques of instruction in the Humanities and Contemporary Civilization courses are very similar. In the Freshman year the students meet four times a week throughout the year in small groups of from 25 to 30 led by one and the same instructor throughout the year. The method of instruction is by discussion. There are frequent quizzes and four times during the year essay examinations are given to test the student's grasp of essential facts, power of organization and discrimination, and ability to express himself fluently and cogently.

The general course in Science as distinguished from the departmental courses in science, was first offered in 1934. It was not required of all students but was made elective for those Freshmen and Sophomores who were interested in science only as a part of a liberal education. It was given with the co-operation of all the scientific departments, in four successive sessions, separately taught. At that time it was not practicable for the course to be given in small sections as in the case of the Humanities and Contemporary Civilization, nor to ask one teacher to carry the course through an entire year. Four instructors from four different departments (Physics, Chemistry, Geology, Zoology) gave the lectures, with occasional lectures by instructors representing other scientific fields. Constant consultations among the instructors giving the course served to maintain a considerable degree of unity. The entire course was organized around the concepts of Matter, Energy, and Radiation;

[1] *College Program in Action.* By the Committee on Plans. Columbia University Press, New York, 1946, pp. 104-105.

the study of the earth as part of the universe ; and the development of plant and animal life.

Though this course had advantages over the departmental science course it was not entirely satisfactory. The Faculty felt that what was needed was a new course in which the nature of science, the concepts that apply to its various branches, the basic results achieved, and an account of the ways in which results can be achieved would be presented systematically. Accordingly a faculty committee composed of those representing the several departments of science was appointed two years ago to study the problem anew. This committee has recently submitted a preliminary report in which it recommends that a two-year sequence in the natural sciences be uniformly required for all students who are candidates for the Bachelor of Arts degree in Columbia College, quite irrespective of whether such students plan to specialize in one of the sciences or to enter one of the scientific professions or not.

The Committee holds that it is most important, from the standpoint of the requirements of an enlightened society and a flourishing science, that a student acquire early in his career sound conceptions concerning the fundamental principles of science and a deep-seated appreciation for the rational use of ideas. The Committee believes that it is certainly more important for a student to acquire this, than that he spend most of his college years in the acquisition of what is often no more than a pedestrian and unimaginative competence in the handling of specialized items of information and in the use of highly specific techniques in old-fashioned departmental courses in science. At the time this article is written the committee is preparing its final report and drafting an outline of the proposed course.

In summary, the education of the embryo scientist in Columbia College consists of two years of foundation courses in the sciences, the social studies and the humanities. In addition he must during these first two years demonstrate proficiency in English prose and at least one foreign language. Moreover he must meet certain physical education requirements. During his last two years he is entirely free to specialize in the science of his choice. By exposure to this kind of curriculum and to this type of training the young man who elects to be a scientist will, we believe, be firmly grounded.

THE UNDERGRADUATE CURRICULUM AT YALE

By R. A. C. Oliver
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An account was given in the February number of the undergraduate curriculum proposed for Harvard and the one followed at Columbia. The latter is also dealt with on page 262. For the information of our readers who may be interested in the improvement of degree courses in universities in this country we offer a summary of the Report of the Committee on the Course of Study for Yale College which was adopted by Yale in 1945.

The Yale curriculum has gone through several fairly radical transformations in the last sixty years. In the last twenty years of the nineteenth century the traditional prescribed course gave way to the system of " electives " in which prescription was almost completely eliminated. During the first decades of this century there was a reaction against a curriculum which had become increasingly chaotic in favour of a compromise between restraint and freedom. Then in 1931 Yale began to stress the more specialised " major " or Honours subjects and largely abandoned the attempt to control the choice and distribution of the other subjects in a student's course. The programme now adopted attempts to establish a balance between freedom of choice, controlled distribution, and specialisation. Approximately a third of a student's time is to be given to subjects of his own choice, a third to certain prescribed groups of studies, and a third to his main subject.

The aim of the new course is to equip the student " to live magnanimously and intellectually in the modern world." The committee has tried " to provide curricula which will be as adequate for our times as the famous curricula of Greece, the Middle Ages, and the Renaissance were for their times." It seeks to lead the student through fundamental studies, to acquaint him with the great fields of learning, to make him reasonably competent in a limited field, and to bring him to a fitting degree of maturity.

The basic studies in which a student is required to prove his competence are the English language, a modern foreign language, and " systematic thinking." The latter requirement is fulfilled by a course in mathematics or logic or linguistics (the structure of language).

To ensure breadth of study, the student is required to select six of the fourteen to twenty courses which constitute his curriculum from a number of fields in the following manner.

Science. Two of the following courses :—
Science I. (Chemistry and Physics).
Science II. (Astronomy and Geology).
Science III. (Botany, Zoology and Psychology).

Social Sciences. One of the following courses :—
Anthropology and Sociology. Economics. Government. History. Psychology.

Classics. One of the following courses :—
Latin. Greek. Ancient History. Greek or Roman Political Ideas. Classical Civilisation.

Literature and the Arts. A course in English or American literature or in literature in Greek or Latin or a modern foreign language, or in the Old and New Testament, or in the fine arts or music.

"*Courses in Integration.*" One course chosen from at least five courses to be offered by different departments. The courses are to be philosophical, historical and synoptic. They are to demonstrate the interdependence of important bodies of knowledge and they should be pointed towards contemporary problems and ideas. "In the past the traditional subject matter of the liberal arts curriculum as a whole was regarded as serving these purposes, and accomplished its purpose for many years, but the integrative function of the curriculum has given way in recent years to specialisation. Even specialists get their best results only if they comprehend the interdependence of the various fields of knowledge."

The course in the basic subjects and those intended to secure breadth of study will normally be completed in the first two years of the four year course, with the exception of the "integration" course, which will be taken in the third or fourth year. In the last two years the student will concentrate on his major subject, to which he will devote at least half his time. The programme also includes a scheme of directed reading in the long vacation.

The committee also put forward two alternatives to the curriculum.

The first of these is the " Scholars of the House " programme (the title dates back to Bishop Berkeley). This frees the very able student from all formal requirements after his second year and enables him to work on his own lines, under supervision. His work culminates in the presentation of an essay in his special field.

The other alternative course is the " Experimental Programme," which is to be tried with a small sample of undergraduates. In the first year the students will follow courses in mathematics, literature, philosophy, an ancient or modern language, and science (physics and chemistry). The second year course will include social science, " historical perspective," philosophy, the literature of the foreign language studied in the first year, and biological sciences. In the last two years the student will specialise in a major subject. Five new " majors," or, as we might call them, Honours Schools, have been devised in an attempt to secure advanced work without excessive narrowness. These five alternative fields of specialism are :— the history of the West, studies in society, literature and the arts, general science, and philosophies and religions. An examination on the whole field is taken at the end of the course and an essay or thesis is required. Much thought has been given to the content of this experimental curriculum and the methods by which it is to be taught and studied.

These new plans will require an increase of about twelve per cent. in staff.

There are several features of the Yale scheme to which the attention of British readers may briefly be drawn.

Yale rightly attaches importance to skill in the use of the tools of learning and requires studies in English, a modern language and " systematic thinking." Exemption from the required courses in these basic studies, and also from the courses required to secure breadth, may be claimed on the ground of school work and a satisfactory standard in the entrance examinations ; but where the preparation is considered inadequate Yale does not neglect to teach subjects like the use of the English language on the ground that the student should have become proficient at school.

The use of linguistics as an alternative to the more usual mathematics is an interesting experiment.

It is noteworthy that the studies the undergraduate is required to pursue in order to acquaint him with the great fields of knowledge are, like those at Harvard and Columbia, studies in the humanities (including classics), in social science, and in science.

The Yale programme lays even more stress on philosophy, particularly in its experimental curriculum, than do the other two colleges. The curriculum as a whole may be compared with those suggested in this country by, for example, Dobree and by the British Association for the Advancement of Science.

The Yale scheme, like those of Harvard and Columbia, requires the teaching of science to non-scientists. The difficulty of this endeavour is well realised in this country, but the desirability of the end hardly needs argument and these American efforts should receive close attention. It is perhaps an advantage in America that there are no separate Faculties of Arts and Science at the undergraduate level.

The new " Major " subjects in the experimental curriculum are of interest to advocates of general Honours degrees. Yale already has " interdepartmental majors " such as French Literature and Philosophy, Philosophy and Government, and History, the Arts and Letters. It is also developing new " major " specialisations in Latin American affairs, Oriental studies, and the Soviet Union.

The Yale programme is an interesting attempt to provide a well-balanced and integrated liberal education for the modern world without foregoing the advantages of specialisation. The American university has the advantage of having a four year course, so that the demands of specialisation are not so apt to elbow out the requirements of general education. Further, a greater proportion of students go on to specialised studies at the post-graduate level.

Whatever one may think of the specific proposals in the Yale plan, it is noteworthy that still another of the most famous universities of America should so boldly reconsider its undergraduate teaching as a whole. One cannot but feel that America's strong position in the world to-day is not due to the intelligent use of its material resources alone.

THE STUDY OF TECHNOLOGY

By Rt. Hon. R. A. Butler

A recent report on " University Education and Business," prepared by a committee appointed by the Cambridge University Appointments Board, draws attention to the changed outlook on education in this country. Recent developments, culminating in the Education Act, 1944, are having, and will continue to have, a marked effect on the social and economic life of the country. The benefits of a university education have, for some time, been extended to candidates from schools of every type and the assessment of a boy's capacity for higher education is now being made at an early age. The whole basis of secondary education has been broadened. By degrees more and more young people will be enabled and encouraged to enter, on their own merit, courses of full-time study at universities and technical colleges and this is a tendency which should be extended.

At no time in our history has the need for highly trained technologists been more important or insistent. The higher wages and generally higher standard of living of the people in this country, compared with those in other countries, and the declining number of available workpeople, as a result of the falling birth-rate and the extension of the compulsory school age, may well preclude us from participating in those world markets where the quantity and cheapness of the articles produced are the determining factors of success. Only through the quality market shall we capture the export trade. This necessitates higher technological skill in everybody from the workman and foreman to the higher executive, but the paramount need is, without doubt, for training technologists of the highest calibre : men who can organise and plan and who can appreciate and develop the discoveries made by research workers.

The necessity for the development of higher technological education and research and for the establishment of higher institutes of technology, has been recognised in reports by various national and professional bodies. Acutely aware of the need to survey our resources for higher technological education and to plan for the future demands upon them, I appointed in 1944 a committee, under the chairmanship of Lord Eustace Percy, to consider the needs of higher technological

education in England and Wales and the respective contributions to be made thereto by universities and technical colleges.

Present Facilities

The development of technical education in this country has never been systematically planned and the responsibility for its provision does not, at present, rest with any particular central body. Although courses covering all grades of technology from craft courses to advanced courses and research are available, facilities vary from district to district and from technology to technology. In general, however, facilities are provided by :—

(a) Universities granting ordinary and post graduate degrees in certain but not all technologies.
(b) Technical colleges offering full-time courses and granting diplomas (or external degrees where such degrees are available).
(c) Technical colleges carrying out part-time work only and usually training students for the National Certificate or the various certificates of the City and Guilds of London Institute.

It is, however, difficult to generalize, if only because all universities and all technical colleges do not offer instruction in all technologies. But it is, in spite of this, probably true to say that there is one important difference between the universities and those technical colleges which offer full-time instruction in the same technologies. No technological teaching at the highest levels can be considered adequate if it does not bring the students into contact with research and research methods ; and it is here that the universities have a distinct advantage. Technical colleges which cater for full-time students also conduct evening classes for still greater numbers of part-time students, and the teachers are, in consequence, so occupied with teaching and administrative duties that they cannot devote their energies to the direction and supervision of adequate research in the same way as university teachers. It must also be admitted that the best men, probably because of a form of intellectual snobbery, gravitate to the universities and the result is that the abilities and qualifications of lecturers in technical colleges are probably inferior.

The type of instruction given by the three categories of institution varies appreciably in scope and in standard. The part-time courses for the National Certificate are peculiarly narrow, giving no thorough

grounding in the fundamental sciences. Nevertheless, these courses fulfil a very useful function by turning out skilled craftsmen and men capable of attaining junior supervisory positions in industry. Unhappily, however, the universities and the full-time courses at technical colleges, which should provide recruits for the higher posts in industry, cannot meet the demand, and many senior executives are, of necessity, men who have attended part-time evening courses.

No university or technical college can obtain the best results in its departments of technology unless these departments have at their disposal the best possible equipment. Here, again, it is difficult to generalize. The standard of equipment varies from institution to institution and from technology to technology, but it is generally true that most departments are carrying on with inadequate equipment.

The Functions of Universities and Technical Colleges

It is suggested in some quarters that technological subjects should not be taught to any great extent in the universities. The reasons given are two-fold. It is held, in the first place, that the universities should confine themselves to imparting a liberal, as opposed to a technical or vocational, training; and, in the second place, that, as a technological education involves both academic instruction and industrial experience, it should not be taken at a university which normally demands three or four years' intensive academic study.

The distinction between vocational and non-vocational training is apt to be over-emphasised. As Sir Frederick Rees pointed out at a recent conference on industrial training, the sharp distinction between a technical and a liberal education is wrong. Technical subjects can be made cultural if they are properly " ordered " and if approached in the right spirit. The learning of Latin can, on the other hand, be definitely " un-cultural " if badly taught.

The second objection can also be criticised as one of over-emphasis. Technology at its highest levels cannot be taught satisfactorily if, to obtain sufficient industrial experience, a student has to confine his academic work to part-time or evening study. Full-time courses should be essential for the training of our best technologists and the universities should (as certain universities do for certain technologies)

be expected to provide some of the necessary facilities. Although it may be confidently argued that the main function of the universities will continue to be the training of scientists for industry and the main function of the technical colleges to train craftsmen and men for the more junior supervisory jobs, the country must look to both the universities and technical colleges to train future administrators and highly trained technical experts.

The Percy Report

Lord Eustace Percy's committee issued its report in July, 1945. Basing its conclusions on a study of engineering technology, it is forced to conclude that the demand for men fitted for executive responsibility, and for men capable of applying the results of research to development, is not being met and that the whole reputation of our national system of higher education in this field depends upon the extent to which it can be met in future. This is, indeed, a gloomy picture, but how much gloomier it might have been had the committee based its conclusions, not on engineering, but on another equally important industry. This is well brought out by a pertinent letter by Lord Barnby published in *The Times* on November 23, 1945 :—

> . . . . . The engineering industry, including shipbuilding, according to the 1935 census of production, employed 1,102,889 persons and its gross annual output was £491,000,000 sterling. Technological training is provided in England and Wales by approximately 23 universities and university colleges with departments of engineering, as well as by a large number of technical colleges and schools. Yet even for this industry, Lord Eustace Percy's Committee admits that important deficiencies exist.
>
> The textile industries, on the other hand, according to the census, employed 1,054,860 persons, with a gross annual output of £446,000,000. These figures are very similar in output and value. Yet the textile industry is served by three institutions of university rank and even this small number includes the Department of Hosiery at Nottingham University College. Moreover, an external degree is not available either for full-time or part-time students. If, then, the needs of the engineering industry are acute, those of the great textile industries would appear indeed critical . . . . . .

While it is difficult to summarise briefly a report which deals fully with the whole problem from all angles, it suffices to point out that the committee makes two main sets of recommendations.

The disadvantages of evening and part-time day release classes for those students being trained for the higher posts in industry are discussed and the conclusion reached that only courses of higher technological education which will require continuous full-time study over substantial periods are suitable for such students. The committee's first set of recommendations are, therefore, concerned with the selection of a strictly limited number of technical colleges and the development in them of technological courses with a status in no way inferior to the university type of course.

In its second set of recommendations the committee advocates the establishment throughout England and Wales of Regional Advisory Councils to co-ordinate technological studies in universities, colleges of technology and the other technical colleges in the region. As some existing regional bodies tend to be over-weighted on the administrative side, it further recommends the creation of Regional Academic Boards of Technology, composed of the academic heads of universities and technical colleges and of members of their teaching staffs. The functions of these Boards would be to advise the governing bodies of the participating institutions and the Regional Advisory Councils on the development and co-ordination of higher technological studies in each institution and in the region as a whole. Finally, it is recommended that a National Council of Technology should be responsible for advising the Minister and the University Grants Committee upon the national aspects of regional policies.

Implementation of Report

The Percy Report is not, and does not claim to be, a final solution of the problem of organising and developing a comprehensive scheme of technological education, but the implementation of its recommendations would be a most useful step forward towards the ultimate goal. Since the responsibility for their implementation rests primarily although not wholly, on the Ministry of Education, it is good to note there is already evidence that action is being taken to carry out its main recommendations. Circular No. 87 of that Ministry, dated February 20, 1946, urges the immediate creation of (a) Regional Advisory Boards and (b) Regional Academic Boards. Circular No. 98, dated April 10, 1946, deals with the other main

recommendation of the report: the setting up of colleges of technology. But, if the main responsibility lies with the Ministry much will depend on industry itself and its willingness to co-operate. It is, however, already evident that industry is beginning to realise its responsibilities: its attitude to technological education has changed enormously in recent years. If it now demands better technological training for its senior staffs, it appreciates that this demand imposes obligations on itself. Several of our large industrial concerns have recently made grants of money and equipment to technical colleges and universities and have voted grants to provide scholarships. Even more encouraging is the willingness of industry to release members of its staff to lecture in technical colleges and to provide facilities for full-time teachers in the colleges to return to industry in order to keep themselves abreast of modern developments. Many of the larger companies are also setting up their own technical training schemes for all grades of staff. Although much of the technological training will be done in their own training schools, a big demand for advanced training in connection with these schemes will be put on technical colleges, colleges of technology and universities.

These industrial training schemes are of prime importance from another point of view. Industry and the educational institutions training for industry have not, in the past, been getting their fair share of the national ability. Boys in modern secondary, grammar and public schools are prejudiced against an industrial career and those who do enter industry have hitherto not been given sufficient opportunities to turn later to university or other full-time education. Firms running their own technical training schemes and realising the desirability of recruiting a better type of boy into industry, can now go into the schools and attract boys by showing how industry is prepared to help them to secure attractive careers for themselves. Furthermore, selected young men in industry are now being given every opportunity by their firms to take up full-time study at universities or technical colleges.

Technological Research

Reference has already been made to the necessity for technological

research to be carried out at universities and colleges of technology if the highest standards of teaching are to be attained. While this desirable combination of teaching and research has always been achieved in the realm of pure science, it must be admitted that, although university departments of technology and applied science do provide facilities for research, it has been left to the research departments of large firms and to the various research associations set up by the Department of Scientific and Industrial Research after the First World War to carry out the bulk of the technological research in the country. The contribution of technical colleges has, unfortunately, been almost negligible.

Technological research can be divided into two main types: fundamental research and development research. Although the former should be the main interest of the applied science departments of universities, it is encouraging to note that a few of our largest firms are themselves entering on this type of work. Their number must, however, always remain small. As research associations must devote themselves to both fundamental and development work, since, if they neglect the former, the time must come sooner or later, when development work can be carried on no longer, it is essential to determine what work should be carried out in technical colleges.

The Ministry of Education in Circular No. 94, dated April 3, 1946, has given some guidance on this important point. It suggests that probably the most important and suitable type of research for teachers in technical colleges is applied research, undertaken at the direct or indirect suggestion of industry and commerce. While I agree with the general suggestions of the Ministry's circular for the ordinary type of technical college, I hope that the new colleges of technology will not confine themselves to this type of development work. If these new colleges are to carry out work of university standard, they should be encouraged to devote themselves to more fundamental long-term problems. While university departments of applied science and the new colleges should not hold themselves aloof from local industry, they should not be encouraged to devote most of their attention to problems put up by individual firms, unless these firms raise no objections to the immediate and widest publication of the results of the researches.

The Status of the Technologist in Industry

The demand for highly trained technologists is increasing. Even when the enlarged and improved educational facilities envisaged are available, there should be no difficulty in absorbing into industry the increased number of technologists from the universities and colleges of technology. It must, however, be admitted that the attitude of certain of the older industries towards the employment of university trained men is very conservative. These industries are usually those which have been developed through the centuries by painstaking, but often brilliant, empirical work. As there is no tradition of research in them, they employ few technologists directly on research and development and their higher executives are not the scientifically trained type of technologist so eagerly sought by some of our newer industries whose very existence is founded on research. If these older industries are to flourish in the future, as they did in the past, they must re-adjust their outlook towards higher technological education.

Are the industries which are anxious to recruit to their ranks the products of the Universities and Colleges of Technology sure that they are getting the best brains available in the country? It is no use providing facilities for teaching technology at the very highest level unless students entering the institutions are of the best type, and industry must realize that it must set out to attract such men. One immediate step that could be taken would be to raise the status of the technological staff in industry. Too often technologists are regarded as inferior to the administrative grades of staff and the number of technologists who ever achieve a seat on the board of a company is very small. While there is unquestionably much to be said in favour of a number of technologists eventually taking administrative appointments, as the administration of many businesses would benefit by the accession of men with a scientific training and outlook, it should not be necessary for a technologist to feel that he must make this change if he is to satisfy his own ambitions and reach the highest posts in his company. Technologists and administrators must work together for the efficient running of a firm and there would appear to be no reason why the technologist could not associate with the administrator on a basis of equality.

TRANSFER OF TRAINING

By Sir Cyril Burt

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The Aim of Education. Some years ago, a well known professor at Columbia University collected replies from heads of American colleges, given in answer to the question: "Why go to College?" The President of Yale replied: "Because such an education provides the best means of developing the power of thought". President Butler quoted an ancient adage: "'The educated man has a sharp axe; the uneducated, a dull axe.' And I would say" (he adds) "that the purpose of a University education is to sharpen the axe to its keenest edge." The Rector of the Catholic University replies: "In one word, to discipline the mind."

Nor is this view confined to the champions of the older subjects. Those who would "substitute an education through science in place of the out-moded mediaeval curriculum" appeal to the same fundamental principle. They urge the change, not so much because a knowledge of physics or chemistry will help the modern youth to understand the part played by science in contemporary civilization, but because the study of the simpler sciences is supposed to supply the best kind of mental gymnasium for strengthening the powers of observation and of reasoning.

The Methods of Education. While those who support their favourite subjects nearly always do so because, they claim it is the best method of training the mind, the psychologist asks the prior questions: Do any of them train the mind at all? In what sense, if any, can the mind be trained? Should we endeavour first and foremost to fill it with useful ideas, principles, habits, and ideals, or should we seek to develop and harden it by appropriate mental exercises, so that it will be able to wrestle more effectively with any type of problem?

It is obvious that any assumptions made about possible methods of education and training require first of all to be tested and verified by psychological research. They are technical questions, like the

food-value of Bovril or brown bread ; they are not matters on which common-sense or casual observation can carry much weight. In view, therefore, of the wide divergence between popular and expert opinion, it seems desirable to review the arguments for and against the traditional doctrine.

(A) *Deductive Arguments.* Whether or not we are disposed to accept the possibility of formal training will depend largely on our views about the way the human mind is constituted and functions. On this there has been a rapid change in standpoint during the last hundred years.

The old notion of the mind, which dominated psychology for so many centuries, pictured the mind on the analogy of the body. Just as the body consists of a number of limbs or members, so the mind was supposed to consist of a number of parts, powers, or faculties ; and, just as a blacksmith strengthens his arms by daily swinging the hammer, it was supposed that by regularly exercising the appropriate faculty you could train the child to observe, to remember, or to reason.

The hypothesis of mental faculties reached its clearest statement with the phrenologists of the early nineteenth century ; and still provides the terminology used by teachers, politicians, and enlightened members of the public when they seek to describe the operations of the mind and to discuss the aims and methods of education. It was finally shattered by the attacks of the associationists. There is, they argued, no general faculty of memory ; we only learn to associate particular ideas. There are no faculties of observation, judgment, or reasoning ; all intellectual process consists solely in the play of associations, aroused by sensory stimuli. The associations thus formed are really (so it was assumed) physiological connections between one group of brain-cells and another. As such they are obviously specific. To suppose that by learning one set of facts or chemical formulae you are strengthening your mind for dealing with another set of facts is like supposing that, by opening up a new line from Bristol to Birmingham, you have made it easier to get from London to Leeds.

On this theory any transfer of training appears impossible ; and it is this theory which, until quite recently, has dominated the views

of most psychologists and physiologists. Of late, however, a vast amount of experimental work on the mental capacities of children and adults, and still more recent work on nerve-conduction within the brain, has led to a far more complex view of mental activity. The associationist's picture proves to be grossly over-simplified.

Early experiments on intelligence tests[1] quickly showed that intelligence itself is not identifiable with accuracy of 'sensory discrimination' as Spearman believed, nor yet with the number of associations the mind can make, as Thorndike maintained. These are but the lowest forms and merely mark the earlier stages. Tests based on such assumptions were adequate enough for detecting the mentally deficient, but altogether useless for assessing the ability of older and brighter children. Intelligence, it was found, essentially involves an implicit use of analogy. It leads to re-adjustment to new situations as a result of experience in former situations; and the new situations are never precisely the same as the old. Thus, all so-called reproduction proves to be analogical reproduction; and reproduction by mechanical association turns out to be merely the lowest limiting type.

First of all, the child does not begin by perceiving and discriminating sensations: even the youngest perceives from the very start concrete and complex patterns, forms, and schemes. It is easier for him to recognize word-forms than to discriminate the single letters. If father sings a tune in the bass, the child can at once reproduce it in a treble key; and he treats the tune as a whole, not as a string of distinguishable pitch-sensations. In the same way, if you sign your name on the blackboard, your first attempt will reproduce your characteristic signature, though you are now using an entirely different set of muscles and of physiological connections. In all such actions there is a transfer of training, inexplicable on associationist principles.

Secondly, simple introspective studies quickly showed that in the higher types of mental process the child does not merely associate; he perceives, however dimly, the *nature* of the association. Consciously or half-unconsciously, he first apprehends relations; and then applies those relations to new contexts to educe fresh analogues.

[1] Cf. Burt, C. *Experimental Tests of Higher Mental Processes*, J. Exp. Ped., I (1911), pp.101, 104.

Compare the drawings of a five-year-old with those of a child of fifteen. The tiny child does little more than reproduce a set of crude symbols for body, trunk, arms and legs, and he assembles them in an almost mechanical fashion. The older child endeavours to reproduce the correct relations—relations not only of size and shape and position, but even of light and shade. This again is quite inexplicable by mechanical association, for the scale both of size and of light and shade is wholly different. Yet in most cases the relations and the correlates are not explicitly educed (as some psychologists have inferred). It is once again the pattern or the scheme as an organized whole which governs the course of the activity. The procedure is synthetic rather than analytic, intuitive rather than logical, though minds of different types show every grade between the two extremes—the implicit procedure of the intuitive mind, the explicit procedure of the analytic.

(B) *Experimental Evidence.* Modern psychology, however, is not content to deduce its answer from general principles. It seeks to verify its tentative deductions by *ad hoc* experiments. There are three main questions to be answered: (1) Does formal training occur? (2) If so, how effective is it as compared with more direct methods of training? And (3) what conditions tend to favour or preclude its appearance?

1. *The Fact of Transfer.* Astonished and impressed by the negative results of the earliest experiments, not a few educational psychologists forty years ago were assuring teachers that "for all practical purposes transfer of training never takes place"; "the time-honoured doctrine of mental discipline is now an exploded superstition". Whether the earliest experimentalists themselves would have countenanced such sweeping denials, is perhaps doubtful. Today no psychologist would question that, in certain cases at least, transfer undoubtedly occurs.

2. *The Amount of Transfer.* But equally all are agreed that its effects are far smaller than had previously been assumed. A survey of the more reliable inquiries shows that the improvement resulting from indirect training varies from —10 per cent to + 30 per cent. (or a little more) of the improvement achieved by direct training. This means that direct training is 5 to 20 times as effective as indirect.

Occasionally, it will be noted, the influence may be negative: there may be actual interference.

3. *The Conditions of Transfer.* Later experimental work has for the most part been concerned, not so much with the possibility or amounts of transfer, but with the special conditions under which it is likely to occur or to reach a maximum.

(a) *Conditions in the Learner.* On the side of the learner, the most important and the best established factor is that of the learner's 'intelligence'. The dull and the mentally deficient can do little more than learn specific and automatic habits. The moderately intelligent show some degree of slow, unconscious transfer; they do best when taught a small number of simple explicit rules with definite instructions about the field of application. The bright are capable of spontaneously discovering and applying a large number of highly abstract principles.

(b) *Conditions in the Task Learnt.* The early laboratory experiments of Thorndike and his colleagues showed clearly that in almost every field the amount of transfer depends far more on similarity of mental contents that on similarity of mental function. The only adequate way to summarize the results is to make a classified list of the kinds of mental processes that appear to mediate successful transfer.

i. *Perceptual Elements.* The earliest experiments were carried out chiefly with the simple sensory stimuli. It was found almost without exception that ability to observe is confined mainly to the particular sphere of observation in which the observer is interested and has chiefly practised. The phonetician's notion of 'ear-training', the familiar efforts at 'sense-training', are both based on the fallacious assumption that such exercises sharpen the eye and ear: actually they operate mainly by enabling the learner to stock his mind with relevant images and with name or symbols for the finer variations he thus comes to discriminate. There is no general faculty of observation, trainable by practice: in every sensory department, the essential thing is to know precisely what to look for.

ii. *Motor Elements.* Later experiments showed that definite muscular actions could be transferred as complete units. Schools that teach typewriting assert that pupils who are skilled pianists learn to type more quickly, because they have practised moving the third

and fourth fingers of both hands separately, accurately and with graded force. But sometimes the transference may prove a positive impediment: those who have learnt the piano have a difficulty in learning the organ, because they still tend to strike the keys instead of pressing them. And everyone is familiar with the faulty transference of speech-sounds from English to French, and from French to other foreign languages, as though the same speech-movements would serve for all.

iii. *Associations.* Habitual associations between certain sensory stimuli and certain thoughts or movements can also be transferred automatically. If in the Latin class I have learnt to associate *terra* with ' earth ', that will help when I see the word ' terre ' in French, or encounter a long technical term derived from the same root, like ' terrestrial '. If at cricket I have learnt to keep my eye on the ball, I shall tend to do so when learning to return the ball at tennis. There is a popular motion that children should learn foreign conversation while very young, because, when they are older, their muscles begin to set and stiffen; actually, with both children and adults, what is supposed to be loss of muscular flexibility springs from the persistence of the habitual neural associations that control those muscles, and so tend to coordinate them in stereotyped ways.

iv. *Simple Ideas.* The commonest types of mental content to get transferred are what are loosely called ' ideas '. The simplest idea is a mental image; and the power of reproductive imagination is given us specifically that we may be able to call up previous sense-perceptions and re-apply them in novel situations. As we have just seen, experiments reveal that much so-called sense-training depends on stocking the mind with mental images of the sensations we want to recognize. If you want to detect an overtone, G, say, when you strike middle C, you sound G first, and keep its ' image ' in your mind, while you listen to the composite note C. In the same way the pupil who has listened to a passage of French spoken by the gramophone, can preserve the auditory images in his mind's ear, and use them to check his own pronunciation.

v. *Complex Ideas.* But the most important ideas that we re-apply in this way are those more complex notions which, if made explicit, would have to be expressed in whole sentences, for example, maxims,

precepts, abstract principles, and general rules-of-thumb. Even in solving a practical or manual problem, much of the transferable improvement (as we learn from numerous experiments) is due to the fact that the learner will generalize certain helpful dodges, often in verbal form, and then re-apply them on subsequent occasions. Here we may see some justification for teaching pupils rules of grammar or mathematics, which they are expected consciously to re-apply in fresh contexts.

vi. *Schemes.* Even in the earlier experiments on the transfer of training it became obvious that—quite apart from definite sensory contents, movements, associations or ideas—vague and more complex methods and plans, often too elaborate to be expressed in words, might nevertheless be readily transferred to new situations. The clearest instances are those in which the learner consciously discovers the best mode of working for himself, and deliberately employs it in a similar yet novel task. Much of the professional skill of the expert consists in picking up methods of attacking different problems within his own particular field. The doctor learns the most systematic way of examining a new patient; the writer of scientific articles learns stock outlines to guide him in drafting his reports.

Introspective evidence reveals that schemes of this kind continually form themselves unconsciously, and direct our subsequent plan of attack without any awareness or effort. Here we may discover the most obvious and important cases of what is termed "incidental learning". Few people who spell irregular words correctly have consciously formulated the complicated rules that govern English orthography. In much the same way, we obey the rules of English grammar, not by thinking of the formulae, but by automatically applying patterns which we have just as automatically picked up.

The formation and use of such schemes may proceed at almost any mental level, from that of complete unconsciousness to that of full, attentive, and deliberate awareness. The two extremes mark the difference between what I have called the synthetic or intuitive type of mind and the analytic or explicit type. But, if we desire to make certain of a transference, the safest policy is undoubtedly to render the process as explicit as possible—to awaken in the learner

a clear consciousness of what has to be transferred, and of how and when the transference is to be made.

To improve the young thinker's powers of scientific reflection, it is futile to seek to strengthen his faculty of reasoning by simply exercising it day by day on problems in algebra or riders in Euclid. Here and there a genius may pick up and use the logical principles unconsciously. The vast majority need systematic guidance. Reasoning is a teachable technique. From the days of Aristotle onwards, efforts have been made to draw up a system of rules governing the forms of thought. If, therefore, we want to teach the growing generation to think critically and accurately, we should instruct them in the general schemes that underlie all valid thinking, just as we now teach them the rules of mathematical proof. We should show them how to formulate the problem they seek to answer, how to frame their hypotheses, how to define their terms, and how to set out an inductive or a deductive argument without slipping into the innumerable traps and fallacies that beset the amateur.

vii. *Emotional Attitudes.* But perhaps the most essential aids to transference consist in the cultivation, not of purely intellectual systems of thought, but of emotional systems, or rather of intellectual systems touched and coloured by emotion. And emotional systems may also be either conscious or unconscious. They may operate unconsciously in the case of repressed complexes, which so easily get transferred, with disastrous effects. And it should be remembered that if, in the hope of disciplining the youthful mind, we make its tasks distasteful, the unpleasant associations are likely to linger on, and infect the student's subsequent attitude towards the whole of the subject taught.

On the other hand, it is just as easy to ensure that the emotions aroused by the teacher or his methods may operate to aid learning rather than to hinder it. And, when they rise to a higher and more conscious level, these emotional enthusiasms serve to build up what the psychologist terms interests and sentiments. Of these, by far the most effective are what we can call ideals.

Thus, it is not sufficient merely to teach our pupils how to observe correctly in this field or that, how to read and listen critically, or how to argue logically according to a rigorous and rational scheme; we

must at the same time make them passionately eager to become first-rate observers, critical readers, and cautious and rigorous reasoners. The idea as well as the method, the enthusiasm as well as the technique, must be firmly implanted. In such cases, what will be transferred is, not so much the particular activity taught, as the end or purpose at which that activity was aimed.

In these last two principles we may see some confirmation of the element of truth in the schoolmaster's cherished belief—that "a liberal education, quite apart from the facts and details of its subjects, has a humanizing function, and may provide the youthful mind in a materialistic age with what it needs so much—an indispensable background of general culture". Here, I believe, the schoolmaster was essentially right and the earlier experimentalists were wrong: he had grasped a truth, but he expressed it in misleading terms. We now can see that the specific associations and specific ideas may all be forgotten, and yet the general atmosphere, the general scheme, the emotional attitudes, and the broad ideals, will still survive. In this sense, it may indeed be better to have learnt and lost than never to have learnt at all.

Practical Corollaries. The implications of all these investigations are too plain to need any detailed discussion. But three points may be emphasized in conclusion. First, it now seems clear that the mental training to be imparted by any subject depends, not so much on the subject itself, but on the way it is presented and taught. The main aim of the teacher, therefore, should be to instil lasting interests and a clear appreciation of methods, rather than a pedantic memory for examinable facts.

Secondly, it is plain that almost any subject can in fact be taught so as to provide an intellectual training. For this purpose the classics, the sciences, and the various branches of mathematics can claim no special pre-eminence. Indeed, it might very plausibly be argued that the type of thinking that is required and practised in translating classical texts or in studying pure mathematics is not the type of thinking that is needed in examining or discussing the problems of a modern civilized community. How many students, for example, who leave our universities have grasped the fact that any conclusions on social matters must be based on arguments from probabilities, not

from certainties? How many know that the first type of reasoning may be just as rigorous as the second, or are familiar with its essential principles?

Thirdly, it seems obvious that the main ground for selecting this or that subject should after all be its concrete content rather than any disciplinary value that it is supposed to possess; and the content of an education that suited the relatively simple society of the Victorian age is no longer adequate for a citizen of the post-war world. This is no reason for abolishing the older subjects; but it is a reason for adding something more. Large portions of the syllabuses, as taught at present, remain wholly detached from the pressing problems of the modern world. If the younger generation is to play an intelligent part in the complex situations arising in the civilized life of today, they require to be instructed both in the basic facts and principles of contemporary life, and in the modes of thinking appropriate to such problems.

The experiments made at many schools on the teaching of art, economics, elementary statistics, social psychology, political theory, and the use of the daily newspapers, show that many masters and mistresses are fully alive to these criticisms. Modern Greats at Oxford, and the increasing emphasis placed elsewhere on the needs of the human or social sciences as distinct from the physical, are further steps in the right direction. Yet there is still much truth in the oft-repeated cry that the universities seem to aim primarily at training academic specialists rather than at imparting the general culture which they claim as their heritage. After all, it will be to the expanding universities that we must look in the near future for those who are to guide, direct, and regulate the growing complexity of our national life. If so, we can no longer assume that, in educating men and women for public life, the content of the higher education does not really matter.

ENGLISH STUDIES

By Graham Hough
Raffles College, Singapore

The progress of the managerial revolution, and the extensive state support for scientific research and teaching make it sufficiently clear that the position of the humanities in education, which has been changing for the last fifty years, is now beginning to change very much faster. Teachers of such subjects in the universities are mostly well aware of the fact: and many are preparing, according to temperament either to fall beside the tattered banner, or to do their duty in the increasingly modest station of life to which it has pleased God to call them. But neither a death in the last ditch nor the life of a gentlewoman in reduced circumstances is likely to help the situation much. A more hopeful symptom would be a thorough attempt, by the university teachers themselves, to review their objectives, and the relevance to them of the actual courses offered. Of philosophy and history I cannot speak, but among teachers of language and literature there has long been a general sense of uncertainty about what they are supposed to be doing. Among teachers of English, indeed, this has been an industrial disease since the days of F. D. Maurice. It would be more profitable at the moment to intensify this sense of unrest than to attempt to allay it. Faculty boards have to be very uncomfortable about their subjects for a very long time before any effect is felt on the syllabus. This is partly due to a desire to preserve traditional values; and partly to the less creditable kind of trade-unionism that finds it easier and safer to go on teaching what one has been taught oneself. The result is that the whole thing becomes a closed economy.

This situation is nowhere more noticeable than in English studies. This is particularly unfortunate, for with the decline of classics English comes for more and more people to represent humane letters in general. University English schools are a fairly recent development, and faced with the respectable antiquity of classics and mathematics have always felt a bashful uncertainty about whether they ought really to exist at all. They began by feeling apologetic to the academic world because everyone can read English already, while to read Latin and Greek at all is fairly hard. And they are not

in a very strong position with the utilitarians: the modern language schools, for instance, can always fall back on the theory that they are producing diplomats or foreign correspondents, or fostering international understanding. Command of a foreign language is in any case an easily recognisable technical skill; to any special attainment of this kind the English school can lay no claim.

In the great days of Professor Saintsbury nobody even knew what English literature was. The major landmarks were familiar to everyone, but the intervening territory had not been mapped. This led to two classes of objections to English studies—one that the subject was too ill-defined to be taught; the other that every civilised person knew it already. But this situation at least gave the scholars of the late nineteenth century a definite line to follow: at that stage the sheer work of exploration, of filling out the gaps in literary history was both exacting and necessary. Now it has been done, and the period of literary history was succeeded (largely under the influence of Walter Raleigh) by a period of rather consciously unacademic literary 'appreciation,' which has been itself subject to fluctuations in taste and critical terminology. All these stages have left their marks on the current English syllabus. What is now demanded of the student of English literature is in effect something like this. Give the names and dates of all famous English authors: give some indication that you like the *Ode to a Nightingale*: say something that might with a little charity be construed as having meaning about realism or romanticism or pity and terror or synaesthesia and, since we must put in something to make it harder, conjugate all the Old English strong verbs. After this people often begin to say that English is a bad academic subject.

The objections commonly made to the usual kind of English course are two: that it is too philological, and that it is too vaguely aesthetic. Both are not usually made by the same person, but it is possible that both are sound. The question of compulsory philology was discussed in an article in the first number of this journal, and there is little to add to the case made there, except for one point of considerable importance; that in English schools philology is often quite consciously added to stiffen up a course otherwise supposed to be rather flabby and formless. The second objection was in effect

made by the early opponents of the English studies in the universities. It is customary nowadays to regard them as dead and damned reactionaries: but persons of this class are nevertheless sometimes right. It is not true, as they were apt to say, that taste cannot be taught: but it is true that you cannot base an adequate education simply on aesthetic values: and that is what the conventional English course sets out to do.

The list of prescribed books in a normal English syllabus consists almost entirely of poems, dramas, novels, works of literary criticism. But at no time were these the sole important elements in the culture as a whole. And the object of an English course should surely be to study English culture as a whole. It is not possible, without falling into pedantry or dilettantism, to separate something called literature from other intellectual activities, and to study it on its own. This was not done in the past, and it is not done in the study of other literature than English. The classical student does not refrain from reading Plato, or read him only for his 'style', on the ground that Plato is 'philosophy'. The student of French literature can hardly avoid knowing a good deal about Descartes. It ought to be equally impossible for the student of English literature to avoid knowing a good deal about Locke. But it is: for the *Essay on Human Understanding* is philosophy and does not come in literature courses. All that the average literary student is likely to know about the Utilitarians is that Carlyle didn't like them: about Darwin, that he couldn't have had anything to do with the passage about apes and tigers in *In Memoriam* because the dates are wrong. Politics, psychology, evolutionary thought are regarded as a slightly disreputable sediment at the bottom of the pure wine of poetry. The fact that very few of the English poets themselves thought like this counts for little.

Poets may be the unacknowledged legislators of the world, but if we want to understand much of the world some further attention to the acknowledged legislators would not be out of place. There is, of course, something in examination syllabuses called 'life and thought'. Life tends to mean something about coffee-houses, and thought something about the Gothic revival. But it is not this kind of attention to the background of literature that is required. What I

wish to suggest is that any book, philosophical, economic, or whatever it may be, should be included in the English course, if it has had an important effect on the general development of thought, as distinct from the development of a particular science. It might sometimes be difficult to apply this general criterion of relevance, and the application of it might arouse considerable debate. But a debate about what books students shall be required to read is precisely what is wanted. There would obviously have to be considerable exclusions, especially as we approach recent times, when scientific theories of the greatest general importance are unhappily beyond the scope of the general reader. But what was commonly read by the educated man in the past can be commonly read by the educated man to-day. *The Leviathan*, or the *Dialogues between Hylas and Philonous*, or the *Wealth of Nations* should be read by students on exactly the same level as *Paradise Regained* or *The Rape of the Lock*.

The first objection to this is doubtless that it makes the English syllabus even more formless than before by including in it large areas of philosophy, history and other subjects, and it would certainly be necessary to find some means of limiting the field. This could be done in two ways. First, by cutting out a good deal of purely literary work of minor and accidental importance. Secondly, by giving the individual considerable discretion in choosing his own course and in following up any particular line of thought that interests him. The thorough study (with the necessary background and cross-references) of comparatively few books would probably be better than the mere covering of the ground of which we have had so much. Objections to poaching on the preserves of philosophers and historians can surely be neglected: education is not a matter of conflicting territorial claims. In any case the student in the English school who reads a philosophic text will not read it in the same way as the philosopher. The philosopher is concerned mainly with the truth or falsehood of the propositions expressed. The English student is concerned indeed, if he is worth educating at all, with the validity of the ideas: but professionally his main business is with their effect on the general course of thought and feeling, often with their effect on matters very remote from philosophy itself. Similarly with religious, political or scientific thought; his reasons for studying

these things and the emphasis he places on them will be different from those of the theologian, the historian or the scientist.

But it will at least not be possible for him, as it is now, to get through an English course without reading a single book with a really difficult intellectual content. And that is the most serious criticism of the usual English course to-day. There is too much vague extensive reading, with the feet on the fender; and not nearly enough close intellectual application. I do not suggest that the study of imaginative literature does not demand close intellectual application: but I am quite sure that at the level at which most undergraduates read it does not get it. It is, for instance, far too easy to read poetry in a verbal or emotional haze: and to find out what to say about it from some text-book afterwards. But it is not easy to read Hume or Mill without making some attempt to follow the argument. And a serious attempt at following an argument is just what most literary students seem unable to make.

An uneasy feeling that the average literary course is not intellectually rigorous enough is the real reason for the retention of compulsory philology. Everybody knows that philology is a highly specialised interest, that it has no necessary connection with an interest in literature, that its only effect on most students is to make them do a certain amount of *ad hoc* cramming. It is retained because it makes things a bit harder; and because it is a good examinable subject in which people are either right or wrong, and their rightness or wrongness is not a matter of opinion. But if this is what is wanted (and there are some grounds for wanting something of the sort) a far better alternative would be logic,* in some form or other. There is no subject which is more in need of it than literary study. Learning logic does not necessarily make people logical: but it may make them rather more sensitive to some of the more glaring fallacies. If the study of English is to be a school of *Literae Humaniores*, and surely it ought to be so, it should make some attempt to teach people how to think, as well as to give them a civilised standard of taste. And this can best be done by close reading of some books where fairly rigorous thinking is going on. The best antidote to the dominance of mere opinion is the practice of following a rational argument.

* The elements of logic, deductive or inductive, may be offered as an alternative to philology in Classical Honour Moderations at Oxford.

Note on Mr. Hough's Article

By D. G. James

Professor of English at Bristol University

Mr. Hough's animated essay will, I trust, help to set going the discussion on English Studies which everyone knows is needed. That he should look, if not for salvation, at least for tonic aid, to philosophy and logic is, I suppose, a sign of the times. The King Edward VII Professor at Cambridge has already looked wistfully in the direction of the philosophers in the course of giving his Inaugural Lecture. But he did so, I thought, with more caution than ardour. His caution was intelligible; for philosophy at Cambridge is hardly a Muse; and Mr. Willey showed a lively practical sense in making Clio the chief object of his wooing.

However that may be, it is certainly not for me to try to adjudicate between the rival claims of history and philosophy for the attention of English Studies. I confine myself to making a few observations on Mr. Hough's thesis that there should be some philosophical study in every Honours course in English. I have every sympathy with Mr. Hough's view, and if I criticize it in a practical point of view, it is through no lack of sympathy with his intention.

My difficulty is this: that if you let in philosophy, it has a way of becoming a cuckoo in the nest. Mr. Hough is restrained enough in his claim; but to study only one English Philosophical Classic is to let in, in a sense, the *whole* of philosophy. Suppose we prescribed Locke's *Essay*, and that in Pringle-Pattison's abridged version of it; we would impose on students whose study is quite predominantly humanist a whole world of speculation with which, or even with parts of which, they could not fairly grapple in the time they could give to it; and I find it hard to believe they could make much of a job of it. For, if the study of the book were really to provide the toughening and intellectual discipline which Mr. Hough wants, it would need to be thought through and over thoroughly. To do it less than thoroughly would do little enough good and might well do harm. And if I am right in this, a Joint School of English and Philosophy is more likely to be satisfactory, a School in which students' time is fairly equally divided between humanist and philosophical

study. Joint Schools no doubt present difficulties of their own; the trouble with them is that they are seldom "joint" enough; they are frequently two things and not one. But this is not a necessary fault.

Now behind Mr. Hough's argument for bringing philosophy into English courses there lie, of course, centuries of European history. He raises old issues; but if they are old, they are not therefore stale. Plato had it out with the Sophists; so did Isocrates, himself a Sophist of a sort. The Humanist tradition got going again in the Middle Ages and culminated in the spiritual beauty of the School of Chartres; but once again Grammar, Rhetoric and Dialectic proved a difficult trio to hold together. Dialectic grew too strong for the others; and it needed the Renaissance to restore the ideals of Humanism. But in Descartes, Hobbes and Locke, Dialectic comes back; and with little sympathy for Humanism; and the philosophers of modern Europe have been little interested in uniting Grammar with Dialectic. The Trivium has always been an ideal, luring the mind, and yet eluding it. Perhaps the great Oxford School of *Literae Humaniores*, a mighty power in 19th Century England, came closest to realizing it.

But now, Classics are in fast decline. We may regret it, but it is true. English is becoming the centre of Humanist studies. We may deplore it, but it also is true. And if so, Mr. Hough is right to ask whether we should not now try to rebuild the Trivium with English Grammar and Rhetoric which will also yet take along with them a real Dialectic. It is certainly something that needs urgent thought. Mr. Hough's idea as it stands will not perhaps work; but that what is in his mind is of the utmost importance I have no doubt.

REVIEWS

The University at the Crossroads. *By* HENRY E. SIGERIST, M.D. *Published Henry Schuman*, New York, 1946. viii + 162*pp*. ($2.75).

This book is a collection of essays and addresses written and delivered during the years of the recent war by the Director of the Institute of the History of Medicine at the John Hopkins University. Half of the essays are concerned with medicine, but Dr. Sigerist does not deal with this subject in a narrow or technical way, and, although he is obviously well-qualified to speak as an expert in this field, it is the way in which he brings out the social implications of medicine and regards it as a humane study that is most interesting.

The other essays which deal with university education generally and the present university situation in America will be of greater interest, however, to the non-medical reader. Dr. Sigerist has a wide knowledge of the European universities as well as the American and was educated in Switzerland, England and Germany. For this reason alone his remarks on the present-day situation in American universities should have value. We in Great Britain are already experiencing a great expansion in university education and are facing a situation in which the universities and a more highly planned society are being brought into a closer relationship. The demands of the country for larger numbers of scientists, technicians and administrators coupled with a greater intake into the universities of students from wider fields of society may very well bring about a situation in which we may profit from an observation of the American scene.

The essays in this collection most relevant to such a consideration are *The University's Dilemma* and *The University at the Crossroads*. The first of these deals with the problem of how far the university teacher (and especially the professor) can hope to meet the demands on his time and energy of teaching, research, and administration. It is a problem that is becoming increasingly familiar in our own universities : how the Head of a large Department can manage to run his Department efficiently and take part in the administration of his university and yet find time for teaching and his own research. Dr. Sigerist does not offer a solution of the problem but he is right when he says that one must be found and found soon.

The essay entitled *The University at the Crossroads* is a plea for a more humane education in a university that has tended to become a training school for technicians.

> " A medical, engineering, or law school that has no room for historical and philosophic studies can produce technicians at best but never educated citizens and educated specialists. The classics form the

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common ground on which specialists meet, and how could they co-operate unless they have a common ground on which to stand?"

Perhaps the situation in America is worse than here because there the universities were apparently used in a much more complete and direct way than in this country, as training establishments for the Armed Forces. On the other hand one finds it difficult in our own situation wholly to understand or share his view that it was entirely to the detriment of the universities that many of their staffs should drop academic studies for a while to undertake duties in the Services and Government Departments.

The situation that Dr. Sigerist depicts is one of great interest to any English reader who is concerned with university education. On the other hand his analysis could sometimes be more profound. It is not so much that one disagrees with his diagnosis, or the suggestions he makes for recovery, as that one wishes that both had been pushed further and made more fundamental. R. L. Brett.

University of Oxford. Annual Reports for the Years 1939-45. *Clarendon Press.*

It would be an admirable thing if all universities were to publish annual reports of this kind; much in them would necessarily be of merely parochial interest—the School Magazine for Old Boys kind of thing—but a great deal would be of general interest and importance as showing how each university is developing. The collected reports from Oxford deal with the war years, and there is much in them which is of historical value only. But even during those years developments were taking shape, and it is interesting to see what they were. The advances made in the study of the social sciences, in the details of medicine, and in the foundation of a school of agricultural studies and forestry are not of outstanding importance, for most universities are growing in these or similar directions; what is more exciting, and of first class importance is the small place created for American studies, and the very large place development for colonial studies, as an extension of what already existed. Oxford is fortunate in having had the means to do this placed at its disposal, and it is to be hoped that it will soon produce lecturers on colonial subjects to go to other universities. At least one civic university wished last year to promote colonial studies, but was unable to find anyone willing to engage in spreading knowledge about the colonies. In addition Town Planning is receiving some attention, and Slavonic studies are being put on a strong basis; Icelandic is also being encouraged, and a Faculty of Music has been created.

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Oxford, it would seem, is merely doing what other universities are doing on a more modest scale and, one wonders in what direction Oxford (or for that matter Cambridge from whence there are no reports) is giving the lead as she is traditionally expected to do. We do not really see in what way Oxford is being different from any civic university, except that it is more fortunately placed, and receives better attention from benefactors. And who, apart from Lord Nuffield, are the chief benefactors? They are precisely those who are endowing the other universities—the big industrial firms. Technology, in short, is being advanced, and Oxford is beginning to wonder whether it is not giving too much energy to solving particular problems instead of attacking the fundamental ones.

Alone among the voices, that of Sir Richard Livingstone is concerned with the quality of human beings produced by the university. In a part of his address as Vice-Chancellor, a part characteristic of him, he declares that all ought to have some knowledge of science, religion, and philosophy: in fact the general humanities need to be insisted upon. Why then does Oxford make (with apparent pride) so mean a donation as £100 to buying objects of anthropological importance? Why does it say that the theatre, of which it approves, must wait for private endowments? If this—one of the greatest

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of popular humanising influences—is not going to be supported by university funds, it will never be supported at all. It is in developments of this kind that Oxford of all places should give the lead out of its own resources. The other things will look after themselves. It may be gratifying to the civic universities to see Oxford falling into line with themselves ; it would be more encouraging if it would point the way to different, and more rewarding goals. Bonnamy Dobrée.

The University of Birmingham : Its History and Significance. *By* ERIC W. VINCENT and PERCIVAL HINTON. *Cornish Bros.* 238*pp.* 25*s.*

This account of the origins, development and present position of the University of Birmingham covers nearly the whole of its short history, from the granting of its charter in 1900 down to 1945. Brief descriptions of the pre-University institutions which provided the bases on which the University was built are given in summary form. These were mainly medical schools and the predominantly science-teaching Mason College. Out of these leading citizens hoped that something more worthy of so important a town could be developed. But they were still somehat blindly groping for a clearer idea of the needs of the Midlands in general and Birmingham in particular, and cautiously calculating the sum of money needed, when there entered on the scene a dynamic personality and the trumpets began to blow. Joseph Chamberlain scorned the idea of merely enlarging the Mason College. He was determined to have something worthy of the rising tide of enterprise in the Midlands. His determination was not to be withstood, and he at once raised a quarter of a million for immediate needs and so the University came into being.

From the first the founders had a strong bias in favour of applied science versus the humanities. This was a natural growth out of the constituent bodies, and the new University was specially planned to meet the commercial and industrial needs of the Midlands. They held that necessity had arisen for giving " to commercial and industrial knowledge and skill a position of equality with that of the law, medicine and pure science in regard to admission to ordinary degrees " and even believed that " so long as the older Universities continue to say in effect that they recognise only ' liberal ' studies, and that, if they offer anything that is useful in life, it is only by accident, the majority of people will keep away from their doors". The teachers of the " liberal studies " had an uphill fight. Chamberlain then " the most alive, sparkling, insurgent, compulsive figure in British affairs " was determined to spend the first quarter million

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pounds on buildings and to let personnel, both professional and student somehow find its way to the buildings. Then, before the next quarter million could be raised, he died. Since then the arts have slowly strengthened their position though the University still bears much of the original stamp.

The authors mention the different conditions under which a University surrounded by a vast town works, compared with large Universities dominating small towns. Its dignity must be less. However, the volume under review suffers from no lack of dignity. It is beautifully produced and illustrated and is on a scale more familiar in business than in university circles. If " the history " is slightly complacent in tone, that is not unnatural in view of what has been accomplished in so short a period as forty-five years. Unfortunately the history was finished just too soon to include an account of the University's reaction to post-war problems and development. It is in their estimate of the University's " significance " that the authors fall seriously short. They do not seem unduly aware of the spiritual values attached to a disinterested search for truth for its own sake.

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CORRESPONDENCE

A Historical University Document

Sir,—I have read the article " A Historical University Document " with great interest, because while we feel the need for some greater co-ordination of university policy than exists at present, we must watch so carefully that the right kind of university independence is preserved. You are, I know, well aware of this need. Whatever the faults of our universities, the fact remains that the independence of our faculties is envied by our European colleagues, and we must be careful not to throw away the baby with the bath water. I have often discussed university organisation with colleagues in the Scandinavian countries, Holland and France (and Germany in former times), and I have had experience of university teaching in the United States. The British university is not tied down to a rigid system of direction and control under a Ministry of Education, nor is it under the direction of a President with wide autocratic powers. It is a peculiarly British institution which has solved the problem of " quis custodiet ipsos custodies " by ensuring that it is in the interest of the existing body of Professors to see that each new man they elect to their body is able and active. We can be justly proud of the method we have developed of preserving a high standard while yet retaining the individual freedom which encourages men to give of their best. The freedom is sometimes abused, but on the whole it has resulted in creating a professorial body which I honestly think is the best and most homogeneous of any country. A university is rated by its staff, and I feel that this complete freedom to choose recruits to it, without autocratic interference by a powerful head, or irrelevant considerations which may affect a State appointment, is the kernel of the problem, and that this independence must be preserved at all costs. A body chosen in this way can exercise a proper democratic control of educational policy and spend the university income wisely.

Yours etc.,

W. L. BRAGG.

Cavendish Laboratory,
Cambridge.

University Conference

Sir,—The suggestion made by Lord Simon in his comments on the Note in the February issue on University Policy and Finance issued by the Vice-Chancellors and Principals, that there should be ' some occasion on which University people can come together to discuss these reports, to make criticisms and to offer suggestions ' is highly opportune.

Such a conference as he proposes would be able, were it properly composed, to discuss not only the plans put forward by the Vice-Chancellors' Committee, but also to express points of view of sections outside the Universities. It could allow industry, for example, to explain

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not only the number of graduates it needs but also the kind of graduates. It would extend the character of the national planning from a discussion of the ways and means of expanding higher education to the wider consideration of the purpose of the expansion: this would have considerable effect in the designing of degree syllabuses and methods of training.

For this reason, when Lord Simon suggested that this proposed conference should be of University people, we hope that he intended that term to bear its widest interpretation, as meaning all persons concerned with higher education from any direction whatsoever. This Conference should be open to such bodies as the National Union of Teachers, and the Joint Four, the W.E.A., the Parliamentary Labour Party Education group, the Trade Unions and Employers' organisations, all of whom have some direct interest in the subject of the conference.

We would like to emphasise the claim of students also to be represented since they are not simply the guinea pigs of other people's plans, but would have many contributions to make in the discussion which otherwise might be neglected. Questions of maintenance grants and hostels, and reading facilities or laboratory space are all the direct concern of students and would occupy a large part of the discussions.

One final point: The suggestion of a conference should not be confined to one national congress. Regional conferences could also be held where the local organisations could join with the local University and colleges in planning the future of higher education in their area.

Yours etc.

TONY SIMMONS

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